

NATO MILITARY LOGISTICS POLICY (CENTRAL REGION):

Management applications, burden sharing problems, consumer logistics control.

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1989



Regulation 3.4.7.:

DECLARATION

I hereby declare that this thesis has been composed  
entirely by myself, and is the result of my own research.  
I attest to this fact with my signature.

C.E. RAWLINSON

Edinburgh  
December 1989



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## ABSTRACT

This thesis consists of seven chapters which highlight the importance of logistics to sustain conventional warfare; identifies shortcomings within NATO's Central Region of Europe, where the UK has committed forces; and suggests methods of overcoming some of the resource deficiencies by enhanced management.

The first chapter defines logistics and highlights the importance of Central Europe to the NATO Alliance. The second chapter examines the albeit changing perspective and nature of conflict in the European Theatre. The third chapter identifies the different military logistics management systems used by the Central Europe NATO Allies and the Soviet forces; and draws interesting conclusions concerning the UK's logistics methods. The fourth chapter examines the sensitive subject of sustainability and logistic stock levels which includes an examination of the burden sharing debate. The fifth chapter defines and examines the concept of interoperability of military means and resources within NATO, an area of weakness. The sixth chapter outlines NATO command responsibilities for logistics in the Central Region, which is also a weak area. The seventh and final chapter summarizes the key areas discussed in the preceding chapters and identifies means of improving NATO military logistics sustainability in Central Europe.

## PREFACE

### Acknowledgements

I am indebted to many individuals and agencies who have helped me in researching for this thesis. In particular, the Ministry of Defence Whitehall Library, The Staff College Library Camberley, Prince Consort's Army Library, and the University libraries of Newcastle upon Tyne, York and Edinburgh.

I am also most grateful for help and encouragement received from many members of NATO's International Staff in Brussels including Lord Carrington when Secretary General. Two people who inspired some elements within this study have sadly passed away; but I wish to record appreciation to Kevin Russell who introduced me to the academic discipline of Organizational Behaviour at the University of Newcastle, and to David Simpson many years friend and sponsor at NATO Headquarters Brussels. They are both remembered with joy.

Finally, a note of sincere regard for my former chief Colonel Jan Schouten of The Netherlands and to my Professor of many years standing - Professor John Erickson. It is they who have principally assisted me along a path where, in Thoreau's words one "hears a different drummer".

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## CHAPTER 1 - INTRODUCTION AND BACKGROUND

...what cannot be supported logistically  
cannot be accomplished tactically.<sup>1</sup>

Erickson

The subject of logistics within academic defence studies tends to take second place to the more exciting aspects of strategy, tactics, military equipment and force strengths.<sup>2</sup> It has been noted by the historian, Martin Van Creveld, that "hundreds of books on strategy and tactics have been written for every one on logistics",<sup>3</sup> however the true professional military analyst well appreciates that one of the keys to successful operations is sound logistic support to the fighting troops, especially when the emphasis is placed upon Generalship in its broadest sense. The military historian, J F C Fuller, noted in his treatise on Alexander the Great that 'supply' provided the basis for the successful strategy and tactics of the Macedonian Army,<sup>4</sup> and somewhat later during the Second World War, the then General Sir Archibald Wavell (later Field Marshal and Viscount) drew attention to 'logistics' a word then not in common use, with this view:

The more I have seen of war, the more  
I realize how it all depends on admin-  
istration and transportation (what our

American allies call logistics). It takes little skill or imagination to see where you would like your forces to be and when; it takes much knowledge and hard work to know where you can place your forces and whether you can maintain them there.<sup>5</sup>

From the opposing party another outstanding wartime field commander, Field Marshal Erwin Rommel, made similar appreciation about supply:

The first essential condition for an Army to be able to stand the strain of battle is an adequate supply of weapons, petrol and ammunition... The bravest men can do nothing without guns, the guns nothing without plenty of ammunition: and neither guns nor ammunition are of much use in mobile warfare unless there are vehicles with sufficient petrol to haul them around.<sup>6</sup>

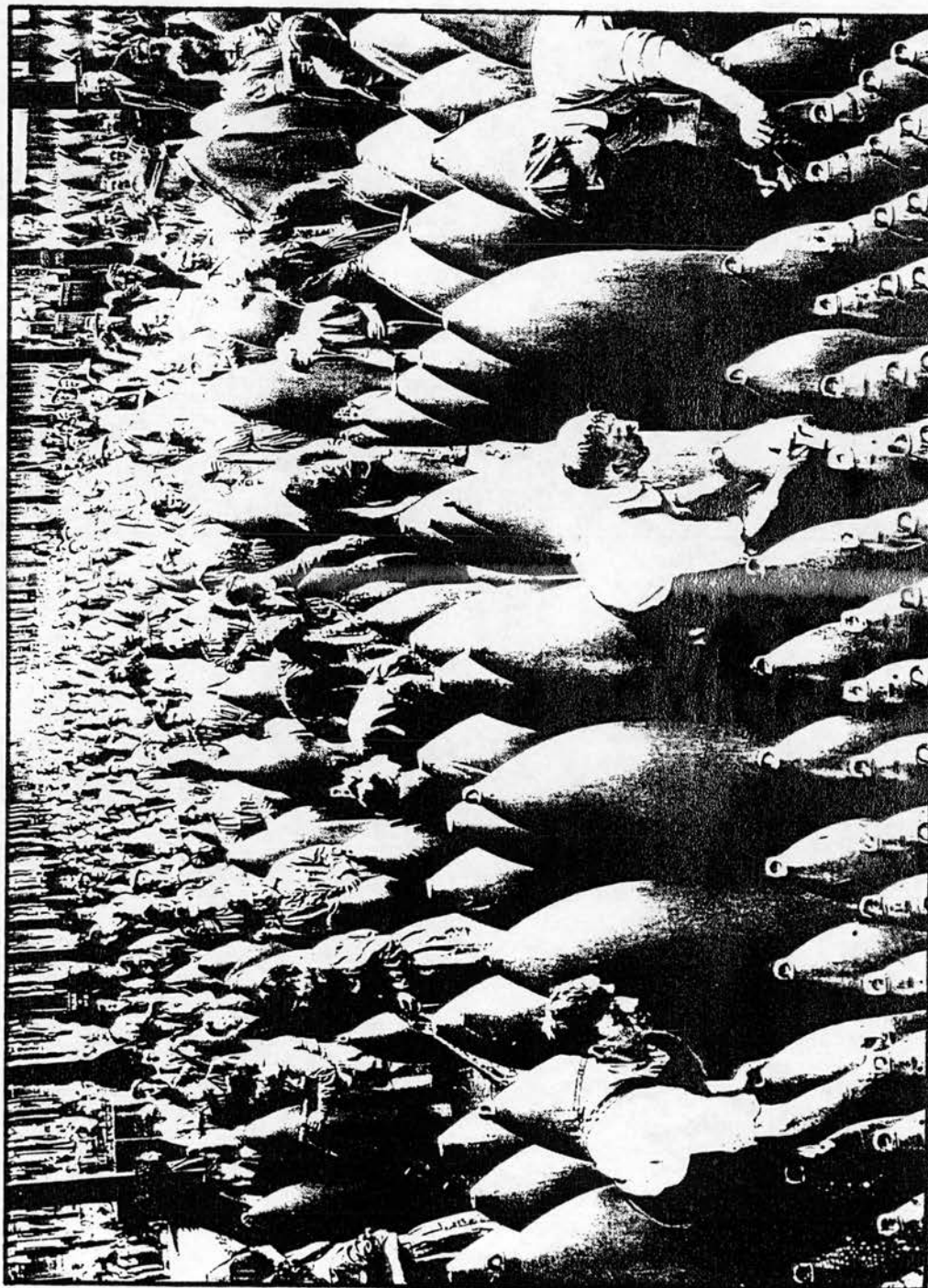
Field Marshal Rommel mentions the term mobile warfare which many military professionals tend to regard, together with 'fire and manoeuvre', as a comparatively recent development; but the Macedonian Army of Alexander the Great is reported to have been the most mobile force in existence at the time.<sup>7</sup> It achieved the ability to make swift marches by training soldiers to carry their arms, armour and rations and making do with a light baggage train. An excellent study on the logistics of this Army by Donald Engels provides a valuable insight into the preparation and planning of military supply in the 4th Century BC.

The comment that "Alexander better understood the capabilities and limitations of his logistic system than perhaps any other commander, before or since"<sup>8</sup> is understandable given the daily supply requirements of a mobile force numbering some 65,000 personnel with 6,100 cavalry horses, and the success with which Alexander moved them into battle.<sup>9</sup> The main demands of grain, forage and water was however not complicated at that time by the needs for ammunition for "even as late as 1870, ammunition had formed only a negligible fraction of all logistic requirements".<sup>10</sup>

The major change came with the First World War which saw staggering expenditures of ammunition. From 1914 to 1918 Britain shipped to France over 170 million shells<sup>11</sup> and the 1916 British offensive on the Somme alone used some 1.5 million shells.<sup>12</sup> Figure 1.0 provides a contemporary view of volume production at a National Shell-filling Factory of the day. The most surprising statistic of the war from a logistics view is that ammunition did not represent the greatest dead weight or volume of supply. The provision of hay and oats outstripped the demands for munitions and the tonnages moved to France during the four years were:

Hay and Oats:	5,439,000 tons
Ammunition:	5,253,000 tons
Petrol and Oil:	759,000 tons <sup>13</sup>





No 4 National Shell - filling Factory  
Chillwell June 1917

Figure 1.0

The latter figure is surprising in an era which saw the first deployment of heavy tanks (Somme 1916), and the introduction of internal combustion engine lorries. However, the figures tell the tale that thousands upon thousands of horses were used for logistic support in the war and Figure 1.1 serves as an appropriate reminder of this fact.

The Second World War placed far greater emphasis upon the requirements for fuel which, when linked with ammunition and essential spares, relegated the demands for subsistence - the updated equivalent of the Macedonian Army's grain, forage and water,<sup>14</sup> from their 100% to a mere eight to twelve percent of all supplies.<sup>15</sup> This fundamental change is tied to the process of logistics primarily needed to support men which was applicable to the armies of Alexander, Napoleon, and to a less extent, those of the Second World War, towards the still developing concept of logistics essentially required to support weapon systems.<sup>16</sup> One learned historian has gauged the proportion for today's supply between ammunition, fuel and the miscellaneous balance needed to support troops to be 30, 40 and 30% respectively with the latter 30% including less than 10% for the subsistence of the soldier.<sup>17</sup> It is suggested that even this freely acknowledged rule of thumb guide is wrong for NATO's Central Region today where the steadily





Transport for the Devon Regiment  
Nr Fricourt August 1916

Figure 1.1

increasing support demands of equipments far outstrips the logistic needs of personnel. Proportions around 40% ammunition, 55% fuel and 5%, the remainder would be nearer the truth for planned conventional mobile operations at today's high intensity levels.<sup>18</sup>

In this introduction we have moved fairly swiftly from the 4th to the 20th Century because while the academic rigour of defence studies is most frequently concerned with historical analysis, this thesis is directed towards NATO logistics of today. The NATO history is only 40 years old, but provides enough lessons to examine current logistic strengths and weaknesses. Although most essential background data are recent for a real historian, conclusions for the future can be made by recognizing the valuable military lessons learned from structured historical study.<sup>19</sup> It is significant that the few books on logistics for the hundreds on strategy and tactics<sup>20</sup> are all historically based with very little attempt to draw lessons for the future. By focusing on the military logistics of NATO's Central Region today, without neglecting the historical experience, this paper attempts to provide a more vivid abstract view.<sup>21</sup>

\* \* \*

Forty years ago the United Kingdom joined eleven

other nations in the capital of the United States to form a defensive alliance.<sup>22</sup> The treaty, known as the North Atlantic Treaty was formally signed on 4 April 1949 in Washington and was ratified by member nations within just five months, see a copy of the document at Appendix A. In time the original twelve signatories to the agreement were joined by four other countries, the last being Spain in 1981. Total membership of the Alliance is now sixteen. The core of the Treaty is Article 5 in which member nations "agree that an armed attack against one or more of them in Europe or North America should be considered an attack on them all".<sup>23</sup> It also commits them to take necessary steps to help each other in the event of armed attack. One former Director of the British Atlantic Commission has expressed the view that "Article 5 must one day take its place among the great proclamations of history, along side the Magna Carta and the US Declaration of Independence"<sup>24</sup> and this represents the highest praise for the drafting of a Treaty which has formed:

...an association of free states joined together to preserve their security through mutual guarantees and collective self-defence as recognized by the United Nations Charter.<sup>25</sup>

Emphasis should be placed upon 'free states' as the NATO Alliance is not a supranational organization, but is inter-governmental where nations retain their

own sovereignty.<sup>26</sup> While maintaining individual independence, countries are allied together in an official group which provides a forum for consultation and coordination of security policies.<sup>27</sup> The formulation of common goals and strategies has resulted in various national commitments to the agreed NATO structure. For the UK the major and most direct contribution involves the allocation of land/air forces to Central Europe on the basis that "The forward defence of the Federal Republic of Germany is in effect the forward defence of Britain itself".<sup>28</sup> This comprises the British Army of the Rhine (BAOR) which has a peacetime strength of 55,000, but would be expanded to a total force of about 150,000 on mobilization, and 12,000 Royal Air Force personnel.<sup>29</sup>

NATO aims to deter Soviet aggression through a strategy of forward defence and flexible response. The concept of forward defence "dates formally from a meeting of the North Atlantic Council in New York in 1950";<sup>30</sup> this logically ties in with the North Atlantic Treaty to defend all territory of the Alliance.<sup>31</sup> The strategy of flexible response, often known by its NATO Military Committee document designation of MC 14/3, was adopted in 1967.<sup>32</sup> The strategy of flexible response means that the Alliance should aim to have sufficient forces to respond to any level of aggression and possess a full spectrum of forces

so that it can counter any act of aggression with an appropriate response. In consequence, NATO forces are made up of three interlocking elements known as the NATO Triad.<sup>33</sup> They are:

- conventional forces strong enough to resist and repel a conventional attack on a limited scale, and to sustain a conventional defence in the forward areas against large scale conventional aggression;
- intermediate and short-range nuclear forces to enhance the deterrent and, if necessary, the defensive effort of NATO's conventional forces against a conventional attack; to deter and defend against an attack with nuclear forces of the same kind; and to provide a linkage to the strategic nuclear forces of the Alliance with the aim of convincing an aggressor that any form of attack on NATO could result in very serious damage to his interests, and of emphasizing the dangers implicit in continuing a conflict;
- United States and United Kingdom strategic nuclear forces which provide the ultimate deterrent.<sup>34</sup>

The most important leg of NATO's Triad of deterrence is the ability to wage a conventional war. The longer the Alliance can sustain a conventional defence, more time is made available for political manoeuvring, but more importantly it delays the possible need to resort to the use of nuclear weapons.<sup>35</sup> This is fundamental not only to keep the nuclear threshold high, but to try to ensure there is no excuse for either side to escalate its choice of weaponry. A strong conventional defence is essential



to meet the true aims of a flexible response strategy<sup>36</sup> and thus temper the undue reliance currently placed by NATO upon the 'unpredictable' aspect of an Alliance response. It is emphasized that the current strategy is not based upon a fixed ladder of escalation; but retains the policy to vary its response.<sup>37</sup>

Although there is a large numerical imbalance between the conventional forces of the Warsaw Pact and NATO,<sup>38</sup> it does not follow that an effective defence cannot be successful against a numerically stronger attacker. Indeed, Clausewitz noted that "the defensive form of warfare is intrinsically stronger than the offensive".<sup>39</sup> Well known terrain and established logistic support systems coupled with mobility and flexibility favour a well trained and determined defender. This can often off-set the strength advantages of an aggressor - up to a certain level.<sup>40</sup> NATO has strong and well trained forces in Central Europe which should be capable of compensating for its numerical deficiencies with effective fighting power. However, fighting power is a combination of many variables of which training, equipment, team spirit, tactics and logistics are, but some of the elements. It has been noted by one historian that "strategy like politics, is said to be the art of the possible".<sup>41</sup> However, what is possible is determined not merely by numbers of troops,

tactical awareness, level of training, quality of arms, determination and morale, but by the facts of what is made available in terms of ammunition, fuel, spares and transport.<sup>42</sup> In other words, logistic support.

The UK Government has described NATO's continuing commitment to Central Europe as "The European Pillar"<sup>43</sup> where it has been noted that the major threat to the Alliance comes from Warsaw Pact forces concentrated along the Inner German Border.<sup>44</sup> However, all pillars need firm foundations and the keystone of conventional defence is the sustainability of forces.<sup>45</sup> It follows that if NATO logistic systems cannot keep pace with demands, or conventional war stocks become exhausted, the remaining option must entail the use of nuclear weapons, irrespective of its further implications. This perspective is quite basic, but all the indications are that the NATO Alliance has become gravely deficient in its ability to sustain a conventional defence.<sup>46</sup> Initially guarded warnings by political and military leaders are now increasing in tempo and forthrightness, for example, the prestigious US commission on integrated long-term strategy reported that:

The US and its allies have frequently stated that their forces in Europe are not equipped to sustain themselves in combat beyond a certain number of days, and that they would then have to turn to nuclear weapons.<sup>47</sup>

A similar view is taken by the North Atlantic Assembly special committee whose report NATO in the 1990s links the need to improve conventional defence to raise the nuclear threshold and highlights supply and ammunition shortfalls which currently limits "the ability of Allied Forces to sustain combat".<sup>48</sup> The warnings have slowly gathered momentum from the veiled hints of several years ago, for example, when the then Commander in Chief Allied Forces Central Europe commented that "the combat value of our forces depends, to a great extent, on the availability of supplies",<sup>49</sup> to a full acknowledgement of logistic deficiencies by today's Supreme Allied Commander Europe.<sup>50</sup> A warning expressed by UK's former Chief of Defence Staff in the House of Lords summarizes the position:

You can only increase the effectiveness of our conventional forces - if that is really the Government's intention - ...particularly through the provision of greater stocks of ammunition in comparison with the sometimes dangerously low levels that exists at present.<sup>51</sup>

Apart from 'dangerously low level' the other key words of the statement are 'if that is really the Government's intention'. This query is not applicable to UK alone as, in a cost limiting environment, all political leaders have a difficult task in applying national priorities to balance the needs of an



effective conventional NATO deterrence. The purchase of expensive up-to-date weapon systems and the maintenance of efficient combat units offers more apparent fighting power than enhancing logistic units or holding adequate war stocks. The former is more apparent to those within the Armed Services, the latter may be more carefully concealed. All the Allies find the provision of credible conventional deterrent forces a severe financial burden.<sup>52</sup> The trend is to minimize costs but, at the same time, endeavour to enhance discernible deterrence. A key area open to adjustment is to improve 'teeth to tail' ratios by maintaining or enhancing the more visible combat forces;<sup>53</sup> but reduce service support systems in terms of personnel, equipment and war stocks. The following comment by the Professor of War Studies at King's College London is relevant:

...any policy of deterrence, whether nuclear or conventional, puts a lot of emphasis on appearances and the appearance of technological dynamism might be valuable whatever the reality.<sup>54</sup>

The reality is that within the Alliance today there is insufficient logistic support providing inadequate conventional sustainability and this situation is rightly causing concern within NATO Headquarters.<sup>55</sup> Apart from the financial considerations briefly mentioned, the major reason for the problem stems from

the original Western European agreement that "Logistics is a purely national responsibility in peace and in war".<sup>56</sup> This principle was endorsed by the North Atlantic Council in 1952;<sup>57</sup> however the simple statement has created one of the weakest links in NATO today and affects the very foundations of the European Pillar. It has resulted in varying types of weapons and ammunition, and differing national views on logistics has caused varying stock levels and has influenced the willingness of nations to place vital logistics under NATO control.

This study is undertaken in the conviction that the keystone of sustainability in respect of conventional defence with nuclear's threat to balance in multinational operations has never really set firm. In addition 'sustainability' is likely to suffer further erosion due to four factors; first, the public perception of an easing of the Soviet threat following the December 1987 INF Treaty;<sup>58</sup> second, the continuing growth of disarmament movements in most European Allies' states; third, the impression given by many learned people, often bolstered by senior military personnel in self defence, that NATO's conventional forces are strong enough to 'see-off an aggressor';<sup>59</sup> and fourth, a desire of most people to see their governments' finite funds spent on peacetime projects providing more visible benefits. However, to repeat the opening sentence of

this study, "...what cannot be supported logistically cannot be accomplished tactically";<sup>60</sup> and in this context it is necessary to consider what is meant by the word 'logistics'.

\* \* \*

'Logistics', both as a word and as a concept forms the whole basis of this study, focusing on NATO's Central Region. An explanation of its meaning is necessary. Some two decades ago, the word logistics was not often used in relation to British Military activity. Supplies, transport, movements and medical support were all better known in the Armed Forces. Civil industry however, soon transposed these elements, excluding medical support, into physical distribution management which has developed further to logistics management sometimes prefixed with the word total. This embraces the efficient acquisition, warehousing, inventory control and onward distribution of goods. It plays a significant part in the profitability of corporate enterprise and has consequently gained stature and recognition at board level of many public limited companies today. The Council of Logistics Management of the United States defines logistics management as:

The process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw

materials, in-process inventory, finished goods, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements.<sup>61</sup>

This may seem quite new, however it is not all that different from the old military adage of 'getting the right materials (or troops), in the right quantities, to the right place, in the right condition at the right time'. Furthermore, it was a military man, Antoine Henri Jomini, the Swiss Baron who became a general in the Imperial Army of the Russian Czar who, in 1838, made the distinction between strategy, tactics and logistics. He linked logistics to "the practical art of moving armies" and including "arranging and supervising the march of trains of baggage, munitions, provisions and ambulances".<sup>62</sup> In this respect the modern term physical distribution would not be too wide.

Shifting in time and space from the 19th to the 20th Century, and from the old world to the new; the American historian, Duncan S Ballantine, contributed to the subject knowledge with his book US Naval Logistics in the Second World War.<sup>63</sup> The official US Navy definition of logistics in 1947 was:

The supply of material and personnel, including the procurement, storage,

distribution and transportation of material, and the procurement, housing, training, distribution and transportation of personnel, together with the rendering of services to Naval operating forces.<sup>64</sup>

Ballantine identified from this broad and comprehensive statement the distinction of two main parts:

...the first being the logistics of production and the second the logistics of consumption. The former is that phase of logistic effort, which is carried on under civilian auspices as a predominantly economic function, and within a set of conditions imposed by the nature of the nation's economy. The latter is the phase of logistics more intimately involved in military operations, in which the determining conditions are those of the military situation.<sup>65</sup>

Because the military are more concerned with consumer logistics, the role of production logistics is often given less prominence in post-operation analysis; but acquisition is equally as important as delivery. Today there are several definitions of logistics, civil and military, each tending to place a different emphasis on the relationship of strategy, tactics, production and consumption. However, within NATO logistics is defined as:

The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with:



- design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of material (\*);

- movement, evacuation and hospitalisation of personnel;

- acquisition or construction, maintenance, operation and disposition of facilities;

- acquisition or furnishing of services.<sup>66</sup>

\* material; equipment in its wider sense including vehicles, weapons, ammunition, fuel etc...

Leaving aside medical and personnel considerations, the two aspects of production and consumer logistics are incorporated within the above broad, and all embracing NATO agreed definition. In outline, the two elements are identified as:

Production Logistics: That part of logistics concerning research, design, development, manufacture and acceptance of material.<sup>67</sup>

Consumer Logistics: That part of logistics concerning reception of the initial product, storage, transport, maintenance (including repair and serviceability), operation and disposal of material.<sup>68</sup>

It is the latter aspect of the logistic process, with which this study is primarily concerned, and narrows further consumer logistics to those vital supplies needed by equipped troops to fight and survive in

the field. These supplies comprise:

- bulk supplies (ammunition, petroleum, oil and lubricants (POL) and rations).

- Individually issued expendable items (spare parts and direct exchange items).

- Non-expendable items (weapons and equipments).<sup>69</sup>

Combat units are dependent upon all types of supplies listed above, but the method of obtaining them in battle, varies between the category of items and the method adopted by the nation involved. It could result in a combat unit sending its organic transport rearwards to collect supplies (pull system); or a logistic support unit carrying the stocks forward to deliver them (push system).<sup>70</sup> The varying national systems used in NATO are a direct result of the agreement concerning "logistics is a national responsibility in peace and in war".<sup>71</sup> While the provision of battlefield logistic support encompasses the movement and delivery of three types of supplies (bulk, expendable and non-expendable), it will be appreciated that the most important, in terms of daily consumption, quantity and necessity, are the bulk supplies, in other words rations, fuel and ammunition. Because of the very importance of these supplies, the British name them Combat Supplies, although the NATO designation is Class I, III and V respectively.<sup>72</sup> It is the stock-holding, movement and delivery systems of these essential

items which form an important part of this paper.

\* \* \*

A study of this nature involves the use of NATO military concepts, terms and a number of abbreviations. As an aide, a simple glossary of appropriate abbreviations is included separately at the end of the final chapter.

The scene for this thesis is set in the Central Region of Europe, essentially for three main reasons. Firstly, the Central Region is where Britain's major support to NATO is committed, on the declared principle that the defence of this geographic area represents a part of the defence of the UK itself.<sup>73</sup> In addition, over 40% of the country's total defence budget is devoted to the ground and air forces maintained to support Europe.<sup>74</sup> Secondly, the multi-national mix of Allied forces,<sup>75</sup> deployed in a comparatively narrow zone, provides a complex and challenging study area concerning national logistic stock levels, support systems, and NATO command and control responsibilities. Thirdly, the Central Region is arguably the most important part of NATO's defensive posture, being an area of immense wealth and industrial potential. In the Federal Republic of Germany, some 30% of the population and 25% of its industrial capacity is



located within just 60 miles (100 km) of the Inner German Border (IGB);<sup>76</sup> a tantalizing prospect for a would-be aggressor.

NATO's Central Region is not restricted to the Federal Republic of Germany, but includes other countries, see Figure 1.2. In the words of a former Commander in Chief Central Europe:

It contains the industrial heartland of Western Europe; it includes the Benelux countries and all of the Federal Republic of Germany, south of the River Elbe, and in this area live over 80 million people. It extends from the North Sea to the foothills of the Austrian and Swiss Alps.<sup>77</sup>

While the geographic area of study is set in a NATO command region, it is important to outline its place within the overall Alliance civil and military structure. Because NATO is an international, as opposed to supranational organization, decisions are made by consensus<sup>78</sup> and this in turn demands a number of committees to formulate policy.

At NATO Headquarters in Brussels, the highest decision-making body and forum for consultation within the Alliance is the North Atlantic Council.<sup>79</sup> At Ministerial Meetings of the Council, nations are represented by Ministers of Foreign Affairs and

## NATO'S CENTRAL REGION



Figure 1.2

these meetings are held twice yearly. The Council also meets occasionally at the level of Heads of State and Government. In permanent session, Ambassadors (Permanent Representatives) meet in council, usually at least once a week. The separate Defence Planning Committee (DPC) comprises representatives of countries participating in NATO's integrated military structure and meets, like the North Atlantic Council, both in permanent at Ambassadorial level and twice yearly at Ministerial level. At Ministerial meetings, member nations are represented by Defence Ministers.<sup>81</sup> These two committees essentially form part of NATO's civil structure which is complimented by a military structure; see the diagram at Figure 1.3:

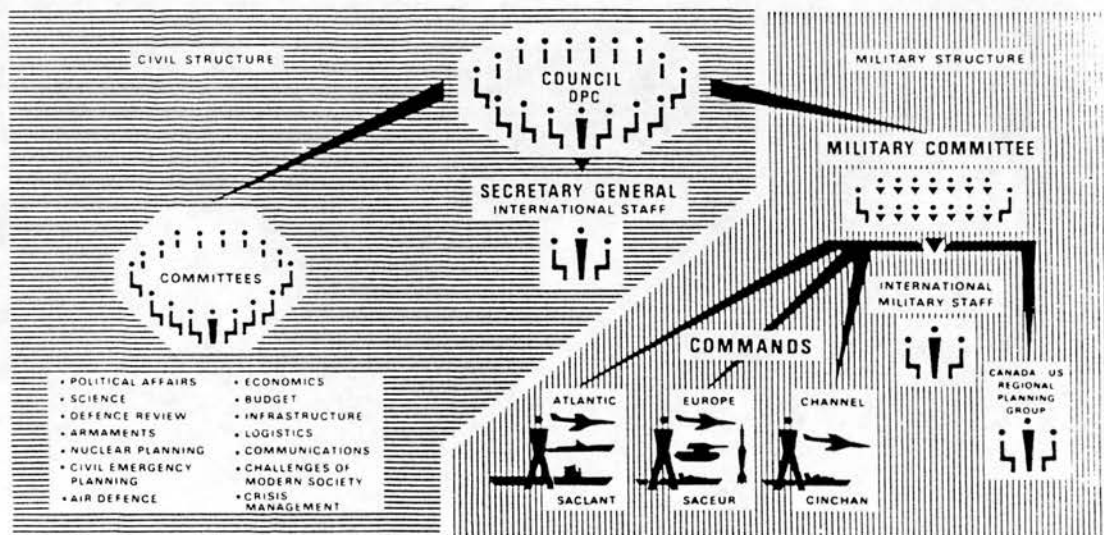


Figure 1.3

The Military Committee comprises the Chiefs of Staff of each member nation of the Alliance, except for France who is represented by a Military Mission<sup>82</sup> and Iceland having no military forces may be represented by a civilian.<sup>83</sup> The Military Committee is the "senior military authority in the Alliance"<sup>84</sup> and meets twice yearly at the Chief of Staff level, but functions on a weekly basis with nations represented by a permanent Military Representative (MILREP).<sup>85</sup> The role of the Military Committee is to advise the North Atlantic Council<sup>86</sup> and the Defence Planning Committee on military matters and provide direction to the three major NATO commanders (MNC's); the Supreme Allied Commander Atlantic (SACLANT), Supreme Allied Commander Europe (SACEUR) and Commander in Chief Channel (CINCHAN), shown in graphic form in Figure 1.3.

The Supreme Allied Commander Europe (SACEUR) is a US four star general, whose Allied Command Europe (ACE) covers an area from the North Cape to the Mediterranean and from the Atlantic to the Eastern border of Turkey, but excluding the UK and Portugal.<sup>87</sup> He exercises control through four major subordinate commands (MSC's), see Figure 1.4, of which Allied Forces Central Europe (AFCENT), as its name implies, covers the Central Region of Europe. The Commander in Chief of Allied Forces Central Europe, who is

The organizational chart for the Supreme Allied Commander Europe (SACEUR) and Deputy Supreme Allied Commanders Europe (DSACEUR) is structured as follows:

- SUPREME ALLIED COMMANDER EUROPE (SACEUR)**
  - Shapoe*
  - Castelan*
  - Belgium*
- DEPUTY SUPREME ALLIED COMMANDERS EUROPE**
- COMMANDER IN CHIEF ALLIED FORCES NORTHERN EUROPE**
  - Feldts*
  - Norway*
  - COMMANDER ALLIED FORCES SOUTH NORWAY**
    - Otto*
    - Norway*
  - COMMANDER ALLIED FORCES NORTH NORWAY**
    - Bogd*
    - Norway*
  - COMMANDER ALLIED FORCES BALIC APPROACHES**
    - Perop*
    - Denmark*
- COMMANDER IN CHIEF ALLIED FORCES CENTRAL EUROPE**
  - Burksum*
  - Netherlands*
  - COMMANDER NORTHERN ALLIED FORCES**
    - Manchen*
    - East Rep*
    - Germany*
  - COMMANDER ALLIED FORCES CENTRAL EUROPE**
    - Hannien*
    - of Germany*
  - COMMANDER ALLIED FORCES SOUTHERN EUROPE**
    - Strome*
    - Turkey*
- COMMANDER IN CHIEF ALLIED FORCES SOUTHERN EUROPE**
  - Naples*
  - Italy*
  - COMMANDER ALLIED AIR FORCES SOUTHERN EUROPE**
    - Venone*
    - Italy*
  - COMMANDER ALLIED NAVAL FORCES SOUTHERN EUROPE**
    - Naples*
    - Italy*
- COMMANDER UNITED KINGDOM AIR FORCES**
  - High Wycombe*
  - U.K.*

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known as CINCENT, is currently a German four star general and he in turn exercises control through three principle subordinate commands (PSC's) comprising two Army Corps named Northern and Central (NORTHAG and CENTAG) and the Allied Air Forces Central Europe (AAFCE) which comprises two separate Allied Tactical Air Forces (ATAF's); the second based in the North and the fourth further South.<sup>88</sup>

The forward areas of AFCENT are, for defence, divided roughly into half and each allocated to an Army Group, together with a supporting Tactical Air Force, see Figure 1.5. The Northern Army Group (NORTHAG) is responsible for the Northern area, running approximately from Hamburg to Kassel, and from the Inner German Border (IGB) to the borders of the Netherlands and Belgium.<sup>89</sup> This area encompasses the British Army of the Rhine (BAOR), which is the peacetime name for all British troops stationed in Germany, including the 1st British Corps. NORTHAG is headed by a British four star general who, in war, commands four separate national Corps; Belgium, British, German and Dutch.<sup>90</sup> It is also likely that the III US Corps would in war be placed under command of NORTHAG.<sup>91</sup> Although the Corps is based in Texas in peactime, with the exception of a forward brigade deployed near Bremen, shown on Figure 1.5, the majority of its equipment, including almost all its ground vehicles,



# AFCENT CORPS AREAS

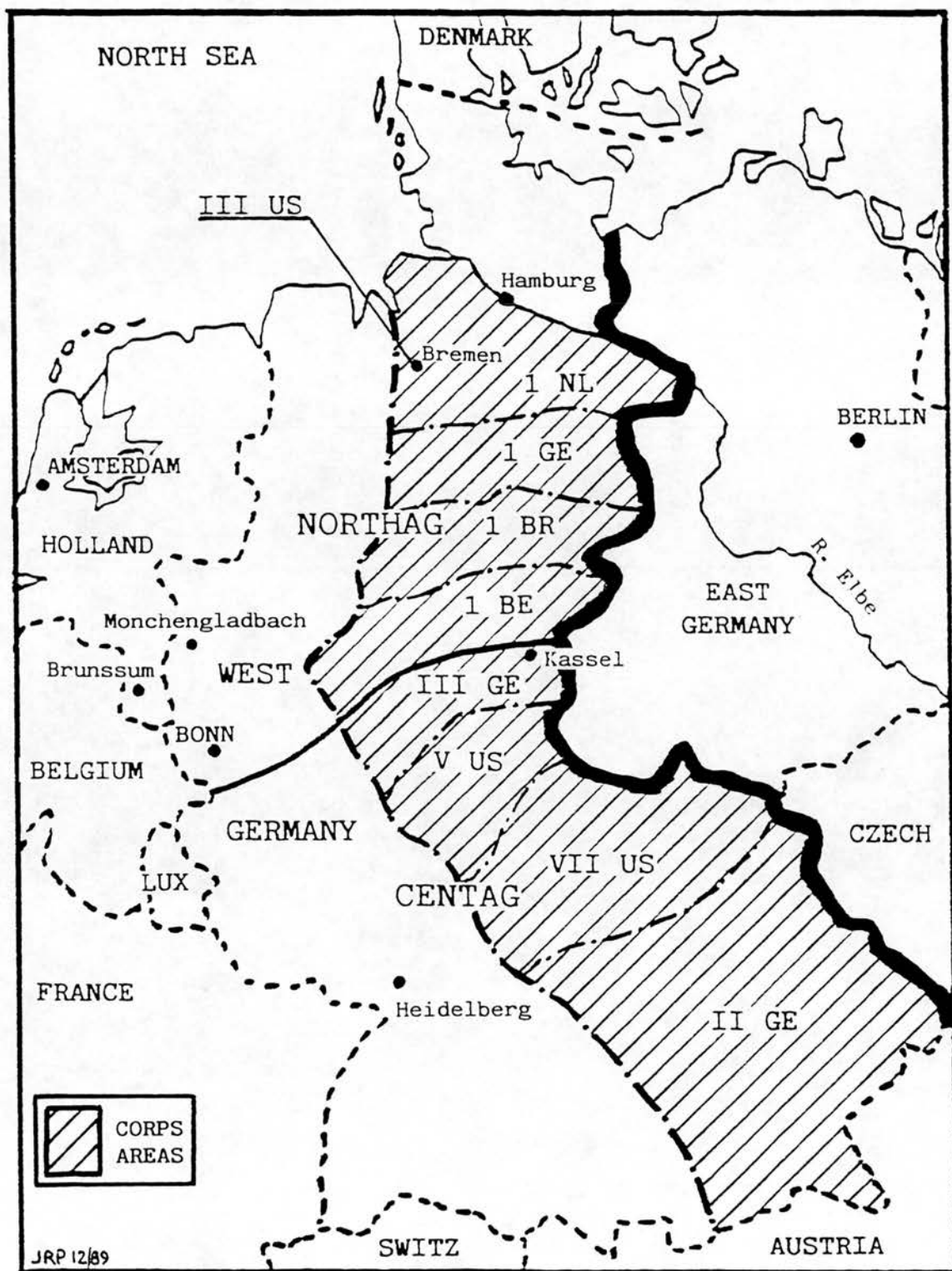


Figure 1.5

are stored in the NORTHAG area.<sup>92</sup>

The Central Army Group (CENTAG) commanded by a US four star general is allocated the Southern part of AFCENT's forward area, running approximately from Kassel Southwards to the borders with Austria and Switzerland, and from the IGB and the Czechoslovakian border to the borders of France, Luxembourg and Belgium. CENTAG commands four Corps; two German and two US, plus a Canadian mechanised Brigade Group. Although France left the integrated military organization in 1966, three French armoured divisions remain stationed in Germany within the CENTAG area. Although these forces are not assigned to NATO, France continues to be a member of the Alliance.<sup>93</sup>

The four Corps within each Army Group are in turn each responsible for their own segment of allocated territory. The 1st British Corps' mission is to defend a sector facing the IGB, "some 65 km wide to the East of Hannover".<sup>94</sup> The depth of this defensive Allied territory is divided into zones, linked to responsibility levels and these are discussed in detail in Chapter 3 as a requisite to understanding current field logistics management procedures.

\* \* \*



The most noteworthy aspect of the Central Region is the international mix of land and air forces. Six nations, excluding France and Luxembourg,<sup>95</sup> belonging to the integrated military structure have a unity of purpose and a declared aim "to prepare together in peace, to fight together in war, to defend its part of NATO territory".<sup>96</sup> The Central Region therefore provides an interesting picture of multi-national defence problems, which not only impacts upon command and control, but also upon logistics. While the agreed Alliance doctrine is that each nation is responsible for the logistic support of its own NATO assigned troops,<sup>97</sup> this very arrangement has led to what one learned observer has described as "the Achilles heel of NATO".<sup>98</sup> The following agreed quote by the then Chief of Logistics Plans and Policy at SHAPE is telling:

After some three years plus that I have spent working in the SHAPE and NATO logistics environment, I conclude that the weakest link in the Alliance capability to present a coherent defence has to be the fragmentation of its logistic structure.<sup>99</sup>

There are four critical areas of NATO logistics which suggest themselves as contributing to the fragmentation described above, and all stem from the "national responsibility"<sup>100</sup> for logistics. They are:

- Battlefield logistic management systems.

- Logistic stock levels.
- Interoperability.
- NATO Command responsibilities of national logistic stocks.

The factors all have a direct impact upon the sustainability of NATO troops in battle and are addressed in this thesis. An examination of NATO logistics involves strategy, structure, economics and cooperation within the Alliance. In management terms, NATO logistics of today has its strengths, weaknesses, opportunities and threats.<sup>101</sup> This study aims to examine perceived flaws and threats, to identify its strengths and to highlight opportunities for building upon them.

\* \* \*

In view of the scope of the subject, it is necessary to outline parameters. The main title of the study "NATO Military Logistics Policy (Central Region)" is correct. It means that the subject concentrates upon logistic policy for land forces and that the geographical bounds are limited to Central Europe where the United Kingdom, together with the United States, provides major support.<sup>102</sup>

Two further parameters, or limitations not addressed

in the thesis, concern the special relationship of France to the Alliance being part of NATO, but not in the integrated military structure, and the influence of European versus American industry. Both areas are worthy of separate studies; however, as they do not affect the conclusions of this thesis, they have been excluded now to save clouding the basic problem.

The problem is that unless the logistic sustainability of NATO's combat troops in Central Europe is improved, the use of nuclear weapons could be invoked at an earlier stage than the public wish; the military are planning for; and for which the governments are responsible for.

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## NOTES - CHAPTER 1

1. Professor John Erickson, "The Soviet 'Conventional Option': Constraints in Time and Space", University of Edinburgh Defence Studies Precs, (1984), pp.1-15.
2. On logistics supply:

Not in ten thousand books written on war is there to be found one on this subject; yet, as Major Shaw writes, 'it forms the basis on which rests the whole stucture of war; it is the very foundation of Tactics and Strategy'.

(Major General J. F. C. Fuller in a preface to G C Shaw, Supply in Modern War (London, 1938), p.9).
3. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge, 1977), p.231.
4. J. F. C. Fuller, The Generalship of Alexander the Great (London, 1958), pp.52-53.
5. The text continues:

A real knowledge of supply and movement factors must be the basis of every leader's plan; only then can he know how and when to take risks with those factors, and battles are won only by taking risks.

(General Sir Archibald Wavell, Speaking Generally, Broadcasts, Orders and Addresses in times of War (1939-43) (London, 1946) pp.78-79).
6. Erwin Rommel, Rommel Papers edited by B.N. Liddell Hart, (London, 1953), p.328.
7. See Donald W Engels, Alexander the Great and the Logistics of the Macedonian Army (Berkley, California, 1978), pp.22-23.
8. Ibid, p.121.
9. Ibid, p.145 shows the grain, forage and water requirements for one day as:

	Numbers	Ration	Weight (lb)
Personnel	65,000	3 lb grain ½ gal (5 lbs) water	195,000 325,000
Cavalry horses	6,100	20 lb grain and forage 8 gal (80 lb) water	122,000 488,000
Baggage animals	1,300	20 lb grain and forage 8 gal (80 lb) water	26,000 104,000
Animals carrying provisions	8,400	20 lb grain and forage 8 gal (80 lb) water	168,000 672,000

10. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge, 1977), p.233.
11. Major General J. F. C. Fuller in a preface to G C Shaw, Supply in Modern War (London, 1938), p.12.
12. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge, 1977), p.233. In contrast the quantity of ammunition moved to Vietnam by US averaged just under 90,000 short tons a month in 1968; see Lieutenant General Joseph M Heiser, Jr., Logistic Support (Washington, D.C., 1974), p.124.
13. C. G. Shaw, Supply in Modern War (London, 1938), p.133.
14. The ultimate 'subsistence' was achieved in Vietnam:  
  
Icecream and eggs to order were not uncommon items at fire support bases, Extensive use of large refrigerators, refrigerator vans and helicopters permitted the troops in the field to enjoy garrison type rations on an almost routine basis.  
  
(Lieutenant General Joseph M. Heiser, Jr., Logistic Support (Washington, D.C., 1974), p.198).
15. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge, 1977), p.233.
16. It was recently noted that:  
  
Almost one-half of the military's uniformed personnel are in some way involved in maintaining and supporting

operational equipment.

(Leonard Sullivan, Jr., "Major Defense Options", The Washington Quarterly (Spring 1989), p.110).

17. Martin van Creveld, "Logistics since 1945", in G Blakey ed., Defence Systems International (London, 1989), p.328.
18. Even in peactime the US Defense Logistics Agency (DLA) reported that in the fiscal year 1989 "fuel purchases comprised 40.6% of DLA's total procurement dollars". W. A. Demers, "40 percent of Dollars go for fuel", Military Forum (August 1989), p.58.
19. This view is well expressed by Major General Varne L Bowers, the US Adjutant General:

While cognizant that history never repeats itself exactly and that no army ever profited from trying to meet a new challenge in terms of the old one, the Army nevertheless stands to benefit immensely from a study of its experience, its shortcomings no less than its achievements.

(Foreword to Lieutenant General Joseph M Heiser, Jr., Logistic Support (Washington, D.C., 1974), p.iii).
20. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge, 1977), p.231.
21. From a management studies view the topic could fairly be described as a 'niche segment'; see Michael E. Porter, Competitive Strategy (New York, 1980), pp.267-269.
22. The formation of NATO was linked to a growing concern about perceived Soviet Union expansionist policies with the 1948 Berlin blockade providing a final impetus. For a concise historical account, see NATO Facts and Figures (Brussels, 1984), pp.13-21.
23. The North Atlantic Treaty (Washington, D.C., 1949), Article 5. See Appendix A to this Chapter.
24. Hugh Hanning, NATO Our guarantee of Peace (London, 1986), p.16.
25. NATO Handbook (Brussels, 1986), p.21.
26. 'Sovereignty', see Joseph Frankel, International



Politics (London, 1973), pp.37-38 for a comprehensive definition. Within the context of this study, sovereignty is taken to mean a nation states independence or freedom from external control. For those NATO members who belong to the EEC, the majority, the implementation of the Single European Act in 1992 will certainly cut into economic and social aspects of sovereignty; see Justinian, "EC legal limits on British sovereignty", Financial Times (3 July 1989), p.40.

27. NATO Handbook (Brussels, 1986), p.21.
28. British Defence Policy 1988-89 (London, 1988), p.21; see also the comment by Sir Geoffrey Howe, "The Atlantic Alliance and the security of Europe", NATO Review (April 1987), p.7.
29. British Defence Policy 1988-89 (London, 1988), p.17.
30. UK Statement on the Defence Estimates 1988 (London, 1988), Volume 1, Cm 344-I, p.15.
31. The North Atlantic Treaty (See Appendix A to this Chapter). Interestingly, the UK's Parliamentary Under-Secretary of State for Defence Procurement conjoins the forward defence strategy to the flexible response strategy of 1967; see The Hon Timothy Sainsbury MP, "The British Army: 1988", Army Quarterly (April 1988), p.139.
32. Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, North Atlantic Assembly Paper Conventional Defence in Europe (Brussels, 1985), p.5. See also Samuel P Huntington, The Strategic Imperative: New Policies for American Security (Cambridge, Massachusetts, 1982), p.22; also John R Galvin, "The Continuing Validity of Flexible Response and Forward Defence", RUSI Journal (Summer 1988), pp.5-9; also NATO Logistics Handbook (Brussels, 1989), p.107.
33. See Elmar Dinter and Paddy Griffith, Not over by Christmas: NATO's Central Front in World War III (Chichester, 1983), pp.9-10; also Bernard W Rogers, "NATO's Strategy: An Undervalued Currency", Adelphi Paper 205 (London, 1986), p.4; also Cornelis de Jager, "NATO's Strategy", NATO Review (October 1986), p.13; also John R Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), p.16. Also see US Department of State Information Agency Atlantic Shield (Washington, D.C., 1989), p.7

34. NATO Handbook (Brussels, 1986), p.27.
35. Highlighted by the former Supreme Allied Commander Europe (SACEUR):

...only the possession of sufficient conventional forces to offer NATO a reasonable prospect of frustrating a Soviet conventional attack will afford our political authorities the confidence to make decisions free from undue Soviet influence.

(Bernard W Rogers, "NATO's Conventional Defence Improvements Initiatives", NATO's Sixteen Nations (July 1986), pp.14-22). This view is maintained by the present SACEUR, see John R Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), p.16.

36. See David Schwartz, "a Historical Perspective", in John Steinbruner and Leon Sigal, eds, Alliance Security: NATO and the No-First-Use Question (Washington, D.C., 1983), pp.12-16. See also Stephen J. Flanagan, NATO's Conventional Defences: Options for the Central Region (Basingstoke, 1988), pp.99-104; also Michael J. Bell, "Flexible Response - is it still relevant?" NATO Review (April 1988), pp.12-17.
37. There are two elements which are often misunderstood. The first concerns NATO's declared ability to be the first to use nuclear weapons if necessary, but not to make a first strike. Neutral observers often transpose 'no first strike' to 'no first use' - quite a different concept. The former is based upon the rationale that the Alliance is defensive in character with the policy "None of our weapons will ever be used, except in self defence" (NATO Heads of State and Government statement contained in A Comprehensive Concept of Arms Control and Disarmament (Brussels, 1989), p.5). See also William L. Dowdy, "The Question of First Use" in J. J. Sokolsky, F. W. Crickard and Robert Boardman eds., NATO: Towards the Year 2000 (Halifax, Nova Scotia, 1987), pp.56-60. The second element concerns flexible response being flexible and not graduated:

NATO does not depend, and has never depended, on a fixed ladder of escalatory options, geared to specific weapons systems, each rung of which has to be retained at all costs. We are in

the business of deterrence...

(David Mellor, "The INF Agreement: Is it a good deal for the West?" NATO Review (December 1987), p.5).

38. It is said that 'bean counts are biased'; however by any standards there remains a large numerical imbalance between the Warsaw Pact and NATO forces in the Central Region. See John R. Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), pp.15-16, 18-21 and 23. See also Anthony H. Cordesman, "Fatal Flaws in Presenting the NATO/Warsaw Pact Balance", Armed Forces Journal International (July 1988), pp.60-66. NATO's publication of its latest assessment Conventional Forces In Europe: The Facts (Brussels, 1988), was followed in less than two weeks by Secretary General Gorbachev's announcement that the USSR would unilaterally withdraw six armoured divisions and 5,000 tanks from Central Europe. However, there will still remain a significant conventional force imbalance; see John H. Milam and Diego A. Ruiz Palmer, "Conventional Forces in Europe - What's in the Graphs?" Armed Forces Journal International (January 1989), pp.47 and 52; also Stuart Whyte, "Military Glasnost and Force Comparisons", International Defense Review (May 1989), pp.559, 561-562, 564-566.
39. Carl von Clausewitz, On War, edited and translated by Michael Howard and Peter Paret (Princeton University Press, 1976), pp.358-359.
40. Although force strength is not the only criteria, there reaches a point when sheer numerical odds must overwhelm. The former Commander of NATO's Northern Army Group has noted:

We must expect that the Pact can achieve a superiority of some 8 : 1 at its point of main effort, and therefore that penetration of the NATO main defensive position is inevitable at this point.

Sir Martin Farndale, "The Use of Helicopters on the European Battlefield", Vertiflite (May/June 1989), p.16).
41. Martin van Creveld, Supplying War-Logistics from Wallenstein to Patton (Cambridge 1977), p.1.

42. A truism:

Military successes and failures can very frequently be traced to the presence or absence of needed supplies, despite the fact that the success of military commanders is often credited primarily to their strategy and tactics.

(Hawthorne Daniel, For want of a Nail - The Influence Logistics on War (New York, 1948), p.xiii).

43. Successive annual UK defence statements have used the analogy of twin pillars, European and North American, supporting a transatlantic bridge to illustrate how the Alliance depends on the partnership aspect of NATO. See UK Statement on the Defence Estimates 1988 (London, 1988), Volume 1, p.4; also Special Report of the North Atlantic Assembly, NATO in the 1990s (Brussels, 1988), pp.11-12 and 22.

44. For a concise background to NATO strategy and the threat to the Central Region see a special report by the US Office of Technology Assessment, Technologies for NATO's Follow-on Forces Attack Concept (Washington, D.C., 1986), pp.8-10.

45. 'Sustainability' is defined as:

the ability of a force to maintain the necessary level of combat power for the duration required to reach its objectives.

(NATO Glossary of Terms and Definitions AAP-6 (P)).

46. See Bernard W. Rogers, Wall Street Journal (5 June 1984), p.16; also, Bernard W. Rogers, "NATO's Conventional Defence Improvement Initiative", NATO's Sixteen Nations (July 1986), p.19. See also Elizabeth Pond, "NATO sees need to beef up Forces", The Christian Science Monitor (28 May 1987), p.9; also Leonard Sullivan, Jr., and Thomas H. Etzold, "Security and Stability in Conventional Forces; Differing Perceptions of the Balance", consultation draft occasional paper The Atlantic Council of the United States (Washington, D.C., 1988), pp.44-45. Special Report of the North Atlantic Assembly, NATO in the 1990s (Brussels, 1988), p.30.

47. From Fred C. Iklé and Albert Wohlstetter,



co-chairman of the Report of the Commission on Integrated Long-Term Strategy, Discriminate Deterrence (Washington, D.C., 1988), p.27. It was reported by The Independent (11 January 1988) the study cost \$20,000 a page. On this basis, the relevant sentence from p.27 is worth \$2,000.

48. Special Report of the North Atlantic Assembly, NATO in the 1990s (Brussels, 1988), p.13.

49. General Dr Ferdinand von Senger und Etterlin, "Defence of Central Europe the Challenge of the 1980s", NATO's Fifteen Nations (Special Issue 2/1981), p.18.

50. Supreme Allied Commander Europe has noted:

...logistic shortfalls limit to a far shorter time than desirable, the length of time that NATO could conduct an effective defense.

(John R. Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), p.23).

51. Field Marshal Lord Bramall in the House of Lords on 29 June 1987 and reported in The Independent (30 June 1987). This public statement contrasts with the evidence given as Chief of the Defence Staff to the House of Commons Defence Committee Session 1984-85 on Wednesday 6 February 1985 and recorded in Minutes of Evidence, paragraph 1334, HMSO 37-ix:

...we have a good record on ammunition. In most cases we are up to the NATO 30 days ammunition scales; there are a few gaps which you would not expect me to mention... Fuel stocks is something which at this moment you could possibly take some risk with.

This author suggests the difference in view is not due to a run-down in stocks over a two year period; but evidence given when 'under command' often varies from when one is free from political control.

52. See Henk Vredeling, Chairman of the Independent European Programme Group study team report Towards a Stronger Europe (Brussels, 1986), Volume 1, pp.1-2. See also Thomas A. Callaghan,

Jr., "Structural Disarmament; A Vengeful Phenomenon", Journal of Defense and Diplomacy (Volume 5, No. 9, 1987), pp.28-31; also, Maarten Engwirda, General Rapporteur Economic Committee in North Atlantic Assembly report General Report on the Economics of Atlantic Security (Brussels, 1987), pp.16-18; and Ian Kemp, "NATO; disarming itself?" Jane's Defence Weekly (13 May 1989), p.857.

53. Identified by UK's Assistant Chief of the Defence Staff (Logistics) as "front window" deterrence. Paper by Major General I. S. Baxter "Sustainability - a concept which may come of age" presented to the King's College London/ MOD Conference "Britain and the Central Region - 18/19 July 1989".

54. Lawrence Freedman, "Logistics and Mobility in Modern Warfare", Armed Forces (February 1986), p.67.

55. Lord Carrington as Secretary General:

The role of logistics is a crucial one, and I have tried in my two years as Secretary General to raise the profile of this issue and to get people to understand that, without support, there is no defence. That is why sustainability now forms such an important part of the special effort agreed by Defence Ministers to improve the Alliance's conventional defences.

(NATO Logistics Handbook (Brussels, 1986), p.(iv)).

56. Western European (Fontainbleu) Document 87, paragraph 42.

57. The key sentence is:

The responsibility for logistic support to national component forces will, in general, remain with the responsible authorities of the nations concerned.

(North Atlantic Council Resolution of 23 February 1952).

58. The Washington, D.C., summit between President Reagan and General Secretary Gorbachev held



in December 1987 concluded in a Treaty:

...without precedent in the history of arms control which will eliminate all land-based intermediate-range nuclear missiles of the two parties, and notable progress in other areas.

(North Atlantic Council Communiqué issued in Brussels on 11 December 1987).

59. General Hans-Joachim Mack, as Deputy Supreme Allied Commander Europe is quoted by Mark Urban and Peter Pringle in The Independent (7 May 1987) as saying:

We could handle a five-to-one Soviet superiority - if we couldn't cope with those Russian peasants, we might as well hoist the white flag now.

(A good example of why military men should stay out of politics).

60. Professor John Erickson, "The Soviet 'Conventional Option'; Constraints in Time and Space", University of Edinburgh Defence Studies Precise (1984), pp.1-15.
61. James R. Stock and Douglas M. Lambert, Strategic Logistics Management (Homewood, Illinois, 1987), p.7.
62. Antoine-Henri Jomini, Precis de l'Art de la Guerre (Paris, 1838), condensed version edited and with an introduction by Brig. Gen. J. D. Hittle, Jomine and his summary of The Art of War (Harrisburg, Pennsylvania, 1947), pp.132-134.
63. Duncan S. Ballantine, US Naval Logistics in the Second World War (Princeton University Press, 1947).
64. Ibid, p.1.
65. Ibid, pp.2-3.
66. NATO Glossary of Terms and Definitions AAP-6 (P).
67. NATO Logistics Handbook (Brussels, 1989), p.151.
68. Ibid, p.147.

69. E. de Fabribeckers, "The Long Tail; Supply and Transport in the Modern Army", NATO's Sixteen Nations (Special 1/1983), p.100.

70. Ibid, pp.100-102.

71. Western European (Fontainbleu) Document 87, paragraph 42. This has been translated by the Belgium Chief of Defence Staff to:

...logistics are a purely national affair.

(General Willy Gontier, "Belgium", NATO's Fifteen Nations (Special Issue 2/1981), p.47).

72. The five NATO Classes of Supply are contained in NATO Standardization Agreement 2961 (STANAG 2961), and repeated in Chapter 4 of this paper. In outline only:

Class I = Food and Forage

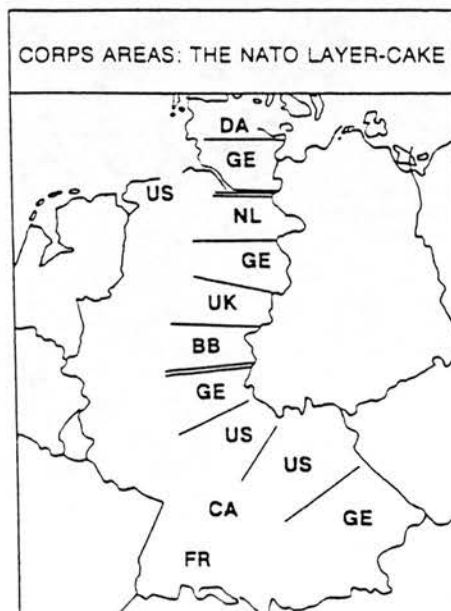
Class III = Fuel

Class V = Ammunition.

73. See UK's Statement on the Defence Estimates 1986 (London, 1986), Volume 1, p.7. See also British Defence Policy 1988-89 (London, 1988), p.21.

74. See Admiral of the Fleet Sir Terrence Lewin, "United Kingdom", NATO's Fifteen Nations (Special Issue 2/1981), p.66. See also the 'estimated costs of defence commitments chart 1989-90' in UK's Statement on the Defence Estimates 1989 (London, 1989), Volume 1, p.38.

75. Multi-national mix:



(Source, David Greenwood, "Towards role specialization in NATO", NATO's Sixteen Nations (July 1986), p.46).

76. This statistic appears in a number of sources; General W. Altenburg, "Strategies and Concepts; The Correlation between Nuclear and Conventional Forces and Prospective Developments", Whitehall Paper Conventional Defence; Issues and Prospects (London, 1987), p.9. General John R. Galvin, "The Continuing Validity of Flexible Response and Forward Defence", RUSI Journal (Summer 1988, p.7. UK's Statement on the Defence Estimates 1988 (London, 1988), Volume 1, p.15. General John R. Galvin, "Trans-Atlantic Partnership for Security; Canada in NATO", Canadian Defence Quarterly (Summer 1988), p.13.
77. General Dr Ferdinand von Senger und Etterlin, "Defence of Central Europe the Challenge of the 1980s", NATO's Fifteen Nations (Special Issue 2/1981), p.16.
78. This principle was reinforced in the study "The Future Tasks of the Alliance (Harmel Report)" adopted by all members of NATO:

As sovereign states the Allies are not obliged to subordinate their policies to collective decision. The Alliance affords an effective forum and clearing house for the exchange of information and views; thus, each Ally can decide its policy in the light of close knowledge of the problems and objectives of the others.

(Report of the North Atlantic Council, Annex to the Final Communiqué of the Ministerial Meeting (Brussels, 1967).

79. NATO Handbook (Brussels, 1986), p.33.
80. A former Minister of Defence has highlighted the fact that while foreign affairs ministers meet at the North Atlantic Council and, in the context of the European Community on an almost monthly basis, defence ministers are isolated to more limited meetings and often attend "as hangers-on of their foreign affairs colleagues".

(Henk Vredeling, "Towards a Stronger Europe", NATO's Sixteen Nations (Dec. 1987 - Jan. 1988), p.23).

81. NATO Handbook (Brussels, 1986), p.33.
82. Ibid, p.35.
83. NATO Logistics Handbook (Brussels, 1989), p.4.
84. NATO Facts and Figures (Brussels, 1984), p.89; also NATO Handbook (Brussels, 1986), p.35.
85. NATO Logistics Handbook (Brussels, 1989), p.4.
86. The Chairman of the Military Committee represents his fellow committee members at meetings of the North Atlantic Council. NATO Handbook (Brussels, 1986), p.35.
87. The defence of the UK and Portugal does not fall under the responsibility of any single NATO Command. NATO Logistics Handbook (Brussels, 1989), p.6.
88. While Commander AAFCE has overall operational control, in practice this control is delegated to the two Allied Tactical Air Force Commanders. They are tasked to maintain cooperation with the Army Groups in their responsibility area. See General Charles A. Gabriel, "The Central Region Air Battle", NATO's Fifteen Nations (Special Issue 2/1981), p.27.
89. See General Sir Michael Gow, "The Defence of the Northern German Plain", NATO's Fifteen Nations (Special Issue 2/1981), pp.34-36.
90. See NORTHAG's Public Information Staff handbook NATO's Northern Army Group (München-gladbach, 1984).
91. See Mark Urban, "Exercise will test NATO battle plan", The Independent (4 September 1987), p.3.
92. See James Meacham, "The sentry at the gate - A survey of NATO's Central Front", The Economist (30 August 1986), p.15.
93. Interestingly, many NATO committee notes/decision sheets are prefixed 'at 15' or 'at 16', depending upon the participation of France.
94. David Fairhall, The Guardian (31 December 1982), p.3; this first publication of the 65 km figure

was considered risqué at the time. The figure now features in British Defence Policy 1988-89 (London, 1988), p.21.

95. Belgium (BE), Canada (CA), Germany (GE), Netherlands (NL), United Kingdom (UK), United States (US).
96. NATO's Northern Army Group (Münchengladbach, 1984), p.1.
97. Western European (Fontainbleu) Document 87, paragraph 42; and North Atlantic Council Resolution of 23 February 1952.
98. James A. Huston, One for All (Newark, Delaware, 1984), p.294.
99. Richard A. Orsini in interview with the Author at Headquarters SHAPE, Mons, Belgium on 14 May 1987.
100. NATO Facts and Figures (Brussels, 1984), p.187.
101. See Colin Eden and Chris Huxham, "Action-Oriented Strategic Management", Journal of the Operational Research Society (October 1988), pp.890-891.
102. See NATO publication Conventional Forces in Europe; The Facts (Brussels, 1988) for an itemized breakdown of each country's support.



# *The North Atlantic Treaty*

Washington D.C., 4 April 1949\*

The Parties to this Treaty reaffirm their faith in the purposes and principles of the Charter of the United Nations and their desire to live in peace with all peoples and all Governments.

They are determined to safeguard the freedom, common heritage and civilisation of their peoples, founded on the principles of democracy, individual liberty and the rule of law.

They seek to promote stability and well-being in the North Atlantic area.

They are resolved to unite their efforts for collective defence and for the preservation of peace and security.

They therefore agree to this North Atlantic Treaty:

## ARTICLE 1

The Parties undertake, as set forth in the Charter of the United Nations, to settle any international dispute in which they may be involved by peaceful means in such a manner that international peace and security and justice are not endangered, and to refrain in their international relations from the threat or use of force in any manner inconsistent with the purposes of the United Nations.

## ARTICLE 2

The Parties will contribute toward the further development of peaceful and friendly international relations by strengthening their free institutions, by bringing about a better understanding of the principles upon which these institutions are founded, and by promoting conditions of stability and well-being. They will seek to eliminate conflict in their international economic policies and will encourage economic collaboration between any or all of them.

## ARTICLE 3

In order more effectively to achieve the objectives of this Treaty, the Parties, separately and jointly, by means of continuous and effective self-help and mutual aid, will maintain and develop their individual and collective capacity to resist armed attack.

## ARTICLE 4

The Parties will consult together whenever, in the opinion of any of them, the territorial integrity, political independence or security of any of the Parties is threatened.

\* The Treaty came into force on 24 August, 1949, after the deposition of the ratifications of all signatory states.



#### ARTICLE 5

The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all, and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defence recognised by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually, and in concert with the other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area.

Any such armed attack and all measures taken as a result thereof shall immediately be reported to the Security Council. Such measures shall be terminated when the Security Council has taken the measures necessary to restore and maintain international peace and security.

#### ARTICLE 6\*

For the purpose of Article 5, an armed attack on one or more of the Parties is deemed to include an armed attack

- on the territory of any of the Parties in Europe or North America, on the Algerian Departments of France †, on the territory of Turkey or on the islands under the jurisdiction of any of the Parties in the North Atlantic area north of the Tropic of Cancer;
- on the forces, vessels, or aircraft of any of the Parties, when in or over these territories or any area in Europe in which occupation forces of any of the Parties were stationed on the date when the Treaty entered into force or the Mediterranean Sea or the North Atlantic area north of the Tropic of Cancer.

#### ARTICLE 7

The Treaty does not effect, and shall not be interpreted as affecting, in any way the rights and obligations under the Charter of the Parties which are members of the United Nations, or the primary responsibility of the Security Council for the maintenance of international peace and security.

#### ARTICLE 8

Each Party declares that none of the international engagements now in force between it and any other of the Parties or any third State is in conflict with the provisions of this Treaty, and undertakes not to enter into any international engagement in conflict with this Treaty.

\* As amended by Article 2 of the Protocol to the North Atlantic Treaty on the accession of Greece and Turkey.

† On 16 January, 1963, the French Representative made a statement to the North Atlantic Council on the effects of the independence of Algeria on certain aspects of the North Atlantic Treaty. The Council noted that insofar as the former Algerian Departments of France were concerned the relevant clauses of this Treaty had become inapplicable as from 3 July, 1962.

#### ARTICLE 9

The Parties hereby establish a Council, on which each of them shall be represented to consider matters concerning the implementation of this Treaty. The Council shall be so organised as to be able to meet promptly at any time. The Council shall set up such subsidiary bodies as may be necessary; in particular it shall establish immediately a defence committee which shall recommend measures for the implementation of Articles 3 and 5.

#### ARTICLE 10

The Parties may, by unanimous agreement, invite any other European State in a position to further the principles of this Treaty and to contribute to the security of the North Atlantic area to accede to this Treaty. Any State so invited may become a party to the Treaty by depositing its instrument of accession with the Government of the United States of America. The Government of the United States of America will inform each of the Parties of the deposit of each such instrument of accession.

#### ARTICLE 11

This Treaty shall be ratified and its provisions carried out by the Parties in accordance with their respective constitutional processes. The instruments of ratification shall be deposited as soon as possible with the Government of the United States of America, which will notify all the other signatories of each deposit. The Treaty shall enter into force between the States which have ratified it as soon as the ratification of the majority of the signatories, including the ratifications of Belgium, Canada, France, Luxembourg, the Netherlands, the United Kingdom and the United States, have been deposited and shall come into effect with respect to other States on the date of the deposit of their ratifications.

#### ARTICLE 12

After the Treaty has been in force for ten years, or at any time thereafter, the Parties shall, if any of them so requests, consult together for the purpose of reviewing the Treaty, having regard for the factors then affecting peace and security in the North Atlantic area including the development of universal as well as regional arrangements under the Charter of the United Nations for the maintenance of international peace and security.

#### ARTICLE 13

After the Treaty has been in force for twenty years, any Party may cease to be a Party one year after its notice of denunciation has been given to the Government of the United States of America, which will inform the Governments of the other Parties of the deposit of each notice of denunciation.

#### ARTICLE 14

This Treaty, of which the English and French texts are equally authentic, shall be deposited in the archives of the Government of the United States of America. Duly certified copies will be transmitted by that Government to the Governments of the other signatories.

## CHAPTER 2 - CHANGING PERSPECTIVES IN THE EUROPEAN THEATRE

We must stand together for negotiated, coordinated, stabilizing reductions against a risk to throw off defense burdens, against a return to the narrow protection of self-interest that could be so dangerous at a time when European politics are in a state of flux rivaled in my adult life only by the immediate aftermath of the Second World War.

President George Bush<sup>1</sup>

This extract from the speech by the US President to the NATO Heads of State and Government on the afternoon of the 4th December 1989 at NATO Headquarters, Brussels highlights the changes which are taking place today in Europe. These changes include a new leadership in East Germany, Poland and Czechoslovakia, peaceful breaches in the Berlin Wall some 28 years after it was erected,<sup>2</sup> open public speculation about the possibilities of a unified Germany, a new people's government in Romania, and seemingly even greater impressions of openness by the Soviet Unions President. All these measures have eased the Western public's perception of a threatening Warsaw Pact. This shift of view occurring at a time when in many countries economic considerations are paramount, may indeed start a move to reduce their defence burdens rightly identified by the acknowledged leader of the NATO Alliance.

The problem is that, in spite of the strictures, it could well be that America will continue to lead from the front and hasten to reduce her own defence expenditure "on the basis of a reduced threat in Europe".<sup>3</sup>

The present times are therefore inspiring for those with an interest in politics, economics or defence - the three are interwoven. However, the purpose of this Chapter is to consider the nature of the threat in NATO's Central Region and endeavour to gauge if the shifting scene has significantly changed the threat, or merely altered the perspective.

Firstly, a brief resumé of some of the important events which brought the US President to Europe to advise his Allies to 'stand together for negotiated, coordinated, stabilizing reductions'.

The most appropriate starting point for a simple modern chronology of important defence related events must be the appointment, in March 1985 of Mikhail Gorbachev to head the Soviet Union.<sup>4</sup> He has proved to be flexible and has been described as having a highly persuasive political and diplomatic approach which poses "unique challenges to Western leadership".<sup>5</sup> In September 1986 the Stockholm Conference on Disarmament in Europe (CDE) agreed on the notification, observation and inspection of military manoeuvres.<sup>6</sup> This was followed just over a year later by the



signing of the INF Treaty in Washington, D.C., by President Reagan and Mr Gorbachev.<sup>7</sup> This important treaty eliminated two categories of land based intermediate-range (1,000 to 5,000 kms) and shorter-range (500 to 1,000 kms) nuclear missiles; but most significantly it provided for the first time, a procedure for on-site inspections.<sup>8</sup> The next notable event was the announcement in December 1988 by Mr Gorbachev at the United Nations that his country had decided to make unilateral cuts in the Soviet Forces by 1991 amounting to 500,000 personnel, 10,000 tanks, 8,500 artillery pieces and 800 combat aircraft.<sup>9</sup> This quite unprecedented move was followed by similar announcements to reduce Armed Forces by the German Democratic Republic and Czechoslovakia. Budget reductions had also been proposed by Poland, Hungary and Bulgaria.<sup>10</sup> Within two months in February 1989 the last Soviet troops withdrew from Afghanistan and, only one month later in March 1989, negotiations on Conventional Forces in Europe (CFE) and confidence - and security-building measures (CSBM) opened in Vienna.<sup>11</sup> At the NATO Heads of State and Government Meeting of the North Atlantic Council the following May, the Allied leaders adopted an arms control and disarmament policy known as 'The Alliance's Comprehensive Concept'. This significant document which effectively lays down Allied policy in this important arms control area is at Appendix A to this Chapter.



At the time of writing (December 1989), the eyes of the NATO nations, with the US out-staring the others,<sup>12</sup> are firmly fixed upon the forthcoming Conventional Forces in Europe (CFE) discussions. The hope is that asymmetrical reductions may provide: one, enhanced security for the Alliance and; two, the ability for nations to trim their own forces and thus make economic savings. The original objectives and proposals of the 16 member countries of NATO published at the outset of the CFE negotiations are reproduced at Appendix B to this Chapter; however, it is emphasized that it should really be treated as a guide for principles, as today's pace of change is quite startling for a 40 year old Alliance. This extract from the latest final communiqué of NATO's Defence Planning Committee which met in Ministerial session in Brussels on 28th and 29th November 1989 shows where the emphasis lies:

We welcome the initiation of unilateral conventional force reductions by the Soviet Union and some of its Allies, but we cannot ignore the fact that, even after completion of these reductions, the Warsaw Pact will retain well-equipped forces which substantially out-number those of the West, underlining the need to reach an early CFE agreement. We therefore look forward to the prospect of a successful outcome next year to the CFE negotiations in Vienna which would substantially improve the balance of forces in Europe. A CFE agreement would have major implications for NATO's collective defence planning.<sup>13</sup>

\* \* \*



The possible changes in force strength in Central Europe has not diminished the NATO Alliance commitment to its strategy of flexible response and forward defence. In May 1989 Heads of State and Government of NATO stated: "For the foreseeable future, there is no alternative to the Alliance strategy for the prevention of war".<sup>14</sup> This view is echoed in the UK's Statement on the Defence Estimates 1989 which points out that even after the unilateral cuts made by the Soviet Union (the 10,000 tanks and 8,500 guns plus additions from Warsaw Pact Allies), the remaining tanks and artillery "in an area from the Atlantic to the Urals will out-number those of NATO by 2.4:1".<sup>15</sup> The main focus tends to fall upon the tank forces when comparing force strengths; but there is an equally serious imbalance in artillery. A former commander of the Central Army Group, General Glenn Otis teamed together with the former commander of the US Field Artillery Center, Brigadier General Paul Pearson to express sincere misgivings about "NATO's chronic inferiority in weight of artillery deployed in Europe".<sup>16</sup> Without wishing to spoil their collective thunder of obvious indignation, this short extract highlights the true realities of combat in the European Theatre:

A NATO division defending on the axis of a Warsaw Pact main attack can expect to be targeted by a 45-minute salvo or preparatory fires consisting of more than 2,000 tons of ordnance. An attack of

this intensity and duration is beyond the experience of even the longest serving military person.<sup>17</sup>

In their article the Generals continued to compare the artillery capabilities of the Soviet Forces with the US and note that the Russians lead in range, rate of fire and quantity of guns. This up-to-date critique of national NATO assigned forces who themselves have more resources than any of their immediate Central Region Allies highlights the strength of the Warsaw Pact threat.

The word threat used in the form outlined above implies an ability to "use force as an instrument of policy".<sup>18</sup> But 'threat' is a combination of capabilities and intentions which are, of necessity, judgement based. While the Western Allies and their peoples may gauge that the Soviet Union's intentions are benign, the scope of their capabilities are highlighted in the following comment made by two authors, of whom one is NATO's current Assistant Secretary General for Political Affairs:

Western perceptions of the Soviet threat are reinforced by the immense and steady build-up of Soviet military capabilities far beyond those that are needed for self-defence or military parity - especially in the European theatre.<sup>19</sup>

It is the weapons systems which could be used to mount

sizeable offensive operations which creates the greatest threat to stability in Europe. These comprise primarily tanks and artillery and it is the sheer quantity of equipments held by the Warsaw Pact, which intimidates the NATO Allies. It was estimated in early 1989 by NATO that the "Soviet Union itself possesses more tanks and artillery than all the other members of the Warsaw Pact and the Alliance combined".<sup>20</sup> It is this quite objective assessment of capabilities which cannot be glossed-over by arguments of good intentions.

To counter the Russians overwhelming military might, NATO relies upon its strategy of deterrence founded upon flexible response as outlined in Chapter 1. The Western approach to deterrence is analysed in a comprehensive study which was undertaken for the United Nations in 1986.<sup>21</sup> It emphasized that the word and concept was politically defensive and that its intention was to discourage aggression. It suggested that: "The French equivalent, dissuasion, expresses the concept and the spirit of deterrence more accurately".<sup>22</sup> Military men tend to prefer more succinct terms and the former Supreme Allied Commander Europe General Bernard Rogers attributed a most concise definition to a Briton. He quoted Michael Heseltine as saying that "the success of our strategy of flexible response rested: 'upon the Russians being in no doubt about the

Allies' ability and will to defend themselves'".<sup>23</sup>

\* \* \*

The 'ability' for NATO forces to conduct an effective defence depends upon an adequate capability for each leg of NATO's triad of forces.<sup>24</sup> It is important that the three legs of the strategy of deterrence remain balanced to provide military capabilities to counter aggression at every level as required.<sup>25</sup> This rationale offers the ability to change strategic responses (to another leg of the triad) through a conscious military-political decision, and not due to a deficiency in one particular element of the triad. As identified briefly in Chapter 1, the weakest leg in NATO's strategy of deterrence today is centred upon conventional forces.

The area of conventional weakness is not a new phenomenon; it was noted some 32 years ago by Henry Kissinger - well before the current NATO strategy had been adopted that:

Almost a decade after its creation, NATO is still without a force sufficient to prevent its members from being over-run by the Soviet Army.<sup>26</sup>

Twenty years later in 1977, US Senator Sam Nunn, together with Senator Dewey Bartlett produced a

report to the US Senate Committee on Armed Services following two trips to NATO forces in Europe. Their quite comprehensive study outlined the flexible response strategy, identified longstanding deficiencies in conventional fire power and urged that ammunition stocks be increased using the emotional words: "The lives of American fighting men must take precedence".<sup>27</sup> By 1985 a North Atlantic Assembly Committee also identified a weak conventional leg of NATO's triad of deterrence and their report included 'sustainability' as one of ten areas of "critical persistent deficiencies".<sup>28</sup> The same year at the instigation of the Supreme Allied Commander Europe, General Bernard Rogers, a Conventional Defence Improvement (CDI) Initiative was launched by NATO Ministers at their May 1985 Defence Planning Committee meeting. It had the objective of identifying key deficiency areas in need of special attention with a view to targeting the allocation of resources.<sup>29</sup> It achieved some success, particularly in the procurement field; however, in a hard hitting article in 1988 the German Deputy Supreme Allied Commander Europe (there are two deputies, one German and one British), General Eberhard Eimler stressed the importance of NATO providing adequate forces for "each of the three legs of the triad", and emphasized the need to strengthen conventional forces.<sup>30</sup>

The above catalogue of weaknesses in NATO's conven-



tional forces in meeting the requirements of Allied deterrence strategy is significant within the context of this study. For, without exception, the criticisms allude, in one form or another, to sustainability or logistics as contributing to the present poor state of affairs. The respected former US Ambassador to NATO, the Hon David Abshire has used the analogy of the NATO triad as a three-legged stool with these words:

I had always said in my speeches across Europe that the deterrent was like a three-legged stool, with the conventional leg much shorter than the others so that the stool was badly out of balance. In light of the Intermediate-Range Nuclear Forces (INF) Treaty, the conventional leg of the deterrent stool, now more than ever, must be made longer and sturdier. The conventional imbalance is the heart of the problem. NATO has never properly strengthened the third, conventional leg of the deterrent.<sup>31</sup>

Thus NATO strategy is described; however, there must surely be a temptation to cut down the other two legs as an alternative method to balancing the stool.<sup>32</sup>

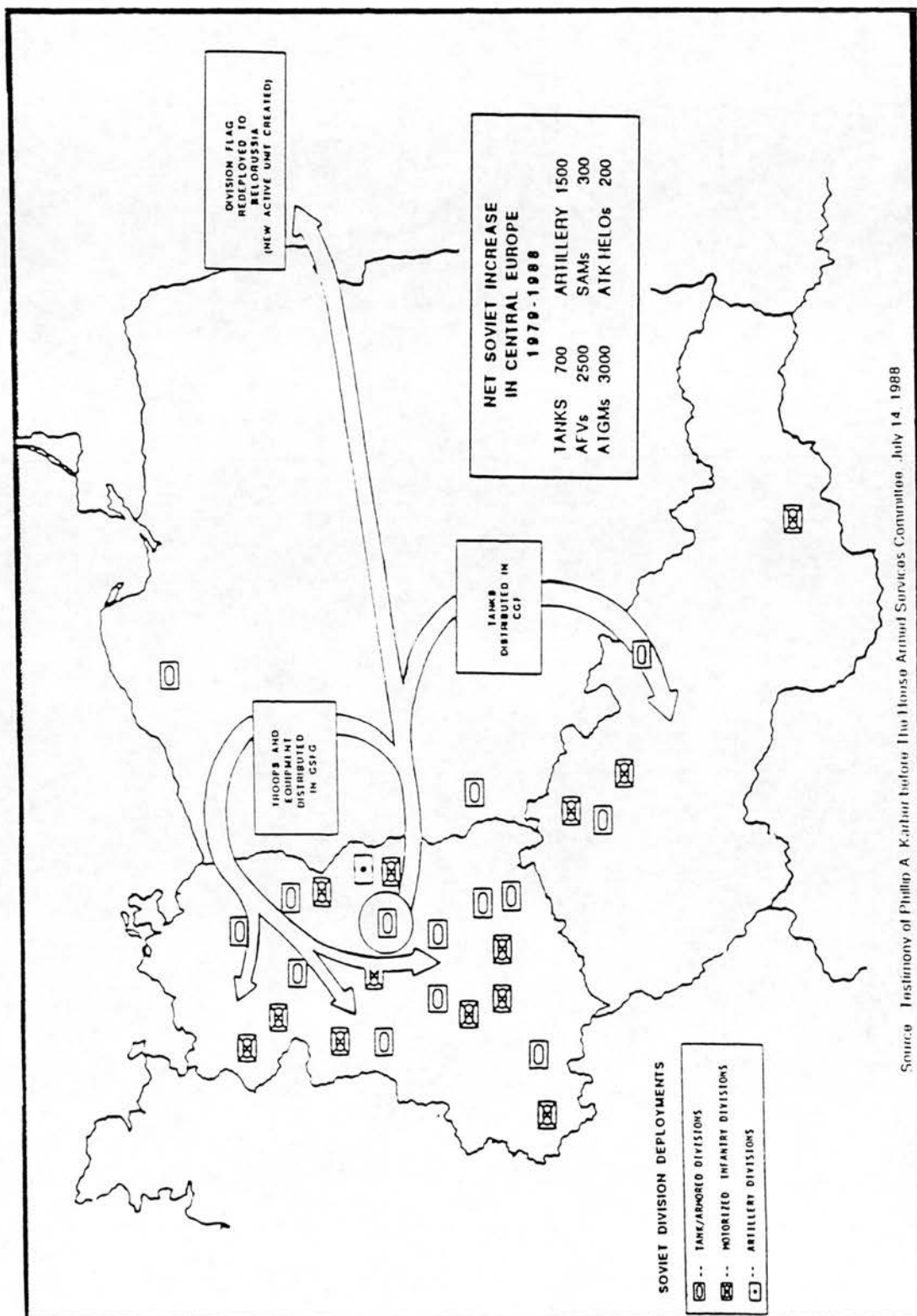
Turning to the Soviet Union and the Western perception of their capabilities; a hawkish view from the US Department of Defense in their annual 1989 publication Soviet Military Power notes:

- Even if the Soviets completely elimin-

ated the forces discussed in Gorbachev's 7 December 1988 United Nations' speech, Warsaw Pact forces would still outnumber NATO in tanks, artillery and divisions by a ratio of over 2 to 1.

- Despite talk of reduced military budgets, Moscow still spends an estimated 15 to 17 percent of its GNP on defense, while the United States spends less than 6 percent
- Although Gorbachev proposes to reduce the Soviet defense budget by 14.2%, since 1985 Soviet Defense expenditures have increased by an average of 3 percent per year in real terms. In comparison, since 1985, United States defense spending has declined in real terms by 11.2%.<sup>33</sup>

The comment 'even if the Soviets' in the first quote above could well reflect suspicion of the Russians actions. According to the defence analyst, Phillip Karber, the 1979 unilateral withdrawal of 6 Guards Tank Division from East Germany to Belorussia, which was widely publicised, saw assets "duplicitiously redistributed in Central Europe";<sup>34</sup> see Figure 2.0. The comment has also been made that what is unilaterally withdrawn (without mutually agreed checks) can be unilaterally replaced.<sup>35</sup> The comment regarding military budgets is also relevant at a time when all the indications are that the Russian production of armaments remains high. According to Supreme Allied Commander Europe, General John Galvin, in 1989 some 3,000 to 3,400 T-72s and T-80s will be produced.<sup>36</sup> The final part concerning overall defence budgets perhaps reflects more the NATO Allies ability to meet



Source: Testimony of Philip A. Karbut before The House Armed Services Committee, July 14, 1988

1979 'Withdrawal' of 6th Guards Tank Division  
Figure 2.0

their agreed 'Resource Guidance' aims,<sup>37</sup> rather than criticize the Soviet Union.

Returning to the theme that 'threat' is a combination of capabilities and intentions; it is fair comment to highlight the Soviet Unions considerable forces which surpass those of every other nation in the world. The subject of intentions is an open question; but certainly it would appear that the leadership is working towards a "master plan".<sup>38</sup> Indeed President Gorbachev "in his book 'Perestroika', shows himself to be more a bearer of a message, for which he is not wholly responsible than the creator of a new regime".<sup>39</sup> Somehow one expects deviousness and significant forward planning from the nation which produces the World's best Chess players. But the momentous changes occurring in Europe almost daily (in December 1989) would have been impossible to accurately forecast. The emphasis placed by President Bush upon this 'state of flux' serves to remind that changes, however welcome, could create destabilizing tensions.<sup>40</sup> It is against this changing pattern of events that arms control negotiations and, in particular a future successful CFE agreement, could be seen to promote greater security between the two Alliances. It is hoped that the framework outlined by NATO Heads of State and Government in their 'Comprehensive Concept' (at Appendix A) will indeed lead to the "stable

balance of conventional forces in Europe at lower  
levels".<sup>41</sup>

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## NOTES - CHAPTER 2

1. President George Bush, speech "Afternoon Intervention on the Future of Europe", delivered at NATO Headquarters, Brussels on 4 December 1989 - author's notes.
2. The Berlin Wall was officially in-place on 13 August 1961.
3. US Secretary of Defense Dick Cheney quoted in Patrick E. Tyler and Molly Moore, "Pentagon Sees Possible 50% Troop Cut in Europe", International Herald Tribune (18 December 1989), p.5.
4. Mikhail Gorbachev succeeded Konstantin Chernenko on 11 March 1985.
5. Special Report of the North Atlantic Assembly, NATO in the 1990s (Brussels, 1988), p.26.
6. See The Alliance's Comprehensive Concept (Brussels, 1989), pp.2-3.
7. The author was privileged to be present in the US State Department on 8 December 1987 - the day the Treaty was signed - accompanying Professor John Erickson of the University of Edinburgh.
8. See Mr Pontillon, Rapporteur of the General Affairs Committee, "Development of East-West relations and Western European security", Western European Union Document 1187 (Brussels, 1989), pp.9-10.
9. Ibid, p.10; see also David Fairhall, "Disarmed by Gorbachev", The Guardian (8 December 1988), p.4; and Simon Scott Plummer, "NATO seeking bigger reduction", Daily Telegraph (8 December 1988), p.8.
10. See Mr Pontillon, Rapporteur of the General Affairs Committee, "Development of East-West relations and Western European security", Western European Union Document 1187 (Brussels, 1989), p.11.
11. CFE and CSBM, see Ibid, p.18 for a short guide.
12. See Patrick E. Tyler and Molly Moore, "Pentagon Sees Possible 50% Troop Cut in Europe", International Herald Tribune (18 December 1989), p.5.

13. Final Communiqué of NATO's Defence Planning Committee meeting held in Ministerial session in Brussels on 28th and 29th November 1989 (Press Communiqué M-DPC-2 (89) 44), pp.1-2.
14. Declaration of the Heads of State and Government participating in the meeting of the North Atlantic Council in Brussels 29th-30th May 1989 (Source: NATO Brussels Information Service).
15. UK's Statement on the Defence Estimates 1989 (London, 1989), Volume 1, p.1; see also Robert Mauthner, "A time for more than jaw-jaw", Financial Times (8 February 1989), p.21.
16. General Glenn K. Otis and Brigadier General Paul F. Pearson, "We're Being Outgunned In Field of Fire Support", Army (April 1989), p.29.
17. Ibid, pp.29-30; this earlier comment by Congressman Courter is relevant:  
  

The Soviet fascination with the effects of artillery is manifested in the 4-to-1 artillery and mortar advantage that S/WP forces enjoy over NATO forces in the Central Region.

(Jim Courter, "Can NATO Strategy Work?", Military Review (June 1987), p.7.
18. Design for Military Operations - The British Military Doctrine (Army Code 71451), p.9.
19. Professor Robert Osgood and Ambassador Henning Wegener Deterrence: The Western Approach (NATO Information Service, Brussels 1986), p.3.
20. NATO 1949-1989 (NATO Information Service, Brussels 1989), p.2.
21. Professor Robert Osgood and Ambassador Henning Wegener Deterrence: The Western Approach (NATO Information Service, Brussels 1986); see also UK's Statement on the Defence Estimates 1989 (London, 1989), Volume 1, pp.11-12.
22. Osgood and Wegener, Ibid p.1.
23. General Bernard Rogers, "NATO Strategy: Time to Change?", The Alliance Papers No. 9 (Brussels, 1985), p.6.
24. See UK's Statement on the Defence Estimates 1989

- (London, 1989), Volume 1, p.3.
25. The three legs are conventional, non-strategic nuclear and strategic nuclear; see Chapter 1.
  26. Henry A. Kissinger, Nuclear Weapons and Foreign Policy (London, 1957), p.271.
  27. Report of Senator Sam Nunn and Senator Dewey F. Bartlett to the Committee on Armed Services United States Senate on January 24, 1977 (US Government Printing Office, Washington, D.C., 1977), pp.19-20.
  28. Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, North Atlantic Assembly Paper Conventional Defence in Europe (Brussels, 1985), p.19.
  29. See General Bernard Rogers, "NATO's Conventional Defense Improvement Initiative", NATO's Sixteen Nations (July 1986), pp.16-20, and 22.
  30. General Eberhard Eimler, "The Way Ahead For NATO Forces", Canadian Defence Quarterly (Autumn 1988), pp.33, 34, 36, 38, and 40.
  31. David M. Abshire, Preventing World War III: A Realistic Grand Strategy (New York, 1988), p.xvii.
  32. Ofcourse, the nearer one sits to the ground, the greater the draught.
  33. Soviet Military Power: Prospects for Change 1989 (Washington, D.C., 1989), p.142.
  34. Phillip A. Karber, "Military Impact of the Gorbachev Reductions", in William B. Taylor, Jr., ed., Beyond Burdensharing (US Mission to NATO Brussels, 1989), p.126.
  35. Ibid, p.125.
  36. General John Galvin, "A Strategy for the Future", RUSI Journal (Autumn 1989), p.15.
  37. See the Resource Guidance issued with the Final Communiqué of the NATO Defence Planning Committee, which met in Ministerial session in Brussels on 8th and 9th June 1989 (NATO Information Service, Brussels).
  38. Testimony of Phillip A. Karber before The US House Armed Services Committee, 14th March 1989.

39. See Mr Pontillon, Rapporteur of the General Affairs Committee, "Development of East-West relations and Western European security", Western European Union Document 1187 (Brussels, 1989), p.3.
40. See Note 1.
41. See The Alliance's Comprehensive Concept (Brussels, 1989), p.11.



**A COMPREHENSIVE CONCEPT OF  
ARMS CONTROL AND DISARMAMENT**

**ADOPTED BY**

**HEADS OF STATE AND GOVERNMENT**

**AT THE MEETING OF THE NORTH ATLANTIC COUNCIL**

**IN BRUSSELS**

**ON 29<sup>TH</sup> AND 30<sup>TH</sup> MAY 1989**



## I. INTRODUCTION

1. The overriding objective of the Alliance is to preserve peace in freedom, to prevent war, and to establish a just and lasting peaceful order in Europe. The Allies' policy to this end was set forth in the Harmel Report of 1967. It remains valid. According to the Report, the North Atlantic Alliance's "first function is to maintain adequate military strength and political solidarity to deter aggression and other forms of pressure and to defend the territory of member countries if aggression should occur". On that basis, the Alliance can carry out "its second function, to pursue the search for progress towards a more stable relationship in which the underlying political issues can be solved". As the Report observed, military security and a policy aimed at reducing tensions are "not contradictory, but complementary". Consistent with these principles, Allied Heads of State and Government have agreed that arms control is an integral part of the Alliance's security policy.

2. The possibilities for fruitful East-West dialogue have significantly improved in recent years. More favourable conditions now exist for progress towards the achievement of the Alliance's objectives. The Allies are resolved to grasp this opportunity. They will continue to address both the symptoms and the causes of political tension in a manner that respects the legitimate security interests of all states concerned.

3. The achievement of the lasting peaceful order which the Allies seek will require that the unnatural division of Europe, and particularly of Germany, be overcome, and that, as stated in the Helsinki Final Act, the sovereignty and territorial integrity of all states and the right of peoples to self-determination be respected, and that the rights of all individuals, including their right of political choice, be protected. The members of the Alliance accordingly attach central importance to further progress in the Conference on Security and Cooperation in Europe (CSCE) process, which serves as a framework for the promotion of peaceful evolution in Europe.

4. The CSCE process provides a means to encourage stable and constructive East-West relations by increasing contacts between people, by seeking to ensure that basic rights and freedoms are respected in law and practice, by furthering political exchanges and mutually beneficial cooperation across a broad range of endeavours, and by enhancing security and openness in the military sphere. The Allies will continue to demand full implementation of all the principles and provisions of the Helsinki Final Act, the Madrid Concluding Document, the Stockholm Document, and the Concluding Document of the Vienna Meeting. The last document marks a major advance in the CSCE process and should stimulate further beneficial changes in Europe.

5. The basic goal of the Alliance's arms control policy is to enhance security and stability at the lowest balanced level of forces and armaments consistent with the requirements of the strategy of deterrence. The Allies are committed to achieving continuing progress towards all their arms control objectives. The further development of the Comprehensive Concept is designed to assist this by ensuring an integrated approach covering both defence policy and arms control policy: these are complementary and interactive. This work also requires full consideration of the interrelationship between arms control objectives and defence requirements and how various arms control measures, separately and in conjunction with each other, can strengthen Alliance security. The guiding principles and basic objectives which have so far governed the arms control policy of the Alliance remain valid. Progress in achieving these objectives is, of course, affected by a number of factors. These include the overall state of East-West relations, the military requirements of the Allies, the progress of existing and future arms control negotiations, and developments in the CSCE process. The further development and implementation of a comprehensive concept of arms control and disarmament will take place against this background.

## II. EAST-WEST RELATIONS AND ARMS CONTROL

6. The Alliance continues to seek a just and stable peace in Europe in which all states can enjoy undiminished security at the minimum necessary levels of forces and armaments and all individuals can exercise their basic rights and freedoms. Arms control alone cannot resolve longstanding political differences between East and West nor guarantee a stable peace. Nonetheless, achievement of the Alliance's goal will require substantial advances in arms control, as well as more fundamental changes in political relations. Success in arms control, in addition to enhancing military security, can encourage improvements in the East-West political dialogue and thereby contribute to the achievement of broader Alliance objectives.

7. To increase security and stability in Europe, the Alliance has consistently pursued every opportunity for effective arms control. The Allies are committed to this policy, independent of any changes that may occur in the climate of East-West relations. Success in arms control, however, continues to depend not on our own efforts alone, but also on Eastern and particularly Soviet readiness to work constructively towards mutually beneficial results.

8. The immediate past has witnessed unprecedented progress in the field of arms control. In 1986 the Stockholm Conference on Disarmament in Europe (CDE) agreement created an innovative system of confidence and security-building measures, designed to

promote military transparency and predictability. To date, these have been satisfactorily implemented. The 1987 INF Treaty marked another major step forward because it eliminated a whole class of weapons, it established the principle of asymmetrical reductions, and provided for a stringent verification regime. Other achievements include the establishment in the United States and the Soviet Union of nuclear risk reduction centres, the US/Soviet agreement on prior notification of ballistic missile launches, and the conduct of the Joint Verification Experiment in connection with continued US/Soviet negotiations on nuclear testing.

9. In addition to agreements already reached, there has been substantial progress in the START negotiations which are intended to reduce radically strategic nuclear arsenals and eliminate destabilising offensive capabilities. The Paris Conference on the Prohibition of Chemical Weapons has reaffirmed the authority of the 1925 Geneva Protocol and given powerful political impetus to the negotiations in Geneva for a global, comprehensive and effectively verifiable ban on chemical weapons. New distinct negotiations within the framework of the CSCE process have now begun in Vienna: one on conventional armed forces in Europe between the 23 members of NATO and the Warsaw Treaty Organization (WTO) and one on confidence- and security-building measures (CSBMs) among all 35 signatories of the Helsinki Final Act.

10. There has also been substantial progress on other matters important to the West. Soviet troops have left Afghanistan. There has been movement toward the resolution of some, although not all, of the remaining regional conflicts in which the Soviet Union is involved. The observance of human rights in the Soviet Union and in some of the other WTO countries has significantly improved, even if serious deficiencies remain. The recent Vienna CSCE Follow-up meeting succeeded in setting new, higher standards of conduct for participating states and should stimulate further progress in the CSCE process. A new intensity of dialogue, particularly at high level, between East and West opens new opportunities and testifies to the Allies' commitment to resolve the fundamental problems that remain.

11. The Alliance does not claim exclusive responsibility for this favourable evolution in East-West relations. In recent years, the East has become more responsive and flexible. Nonetheless, the Alliance's contribution has clearly been fundamental. Most of the achievements to date, which have been described above, were inspired by initiatives by the Alliance or its members. The Allies' political solidarity, commitment to defence, patience and creativity in negotiations overcame initial obstacles and brought its efforts to fruition. It was the Alliance that drew up the basic blueprints for East-West progress and has since pushed them forward towards realisation. In particular, the concepts of stability, reasonable sufficiency, asymmetrical reductions, concentration on the most offensive equipment, rigorous verification, transparency, a single zone from the Atlantic to the Urals, and the balanced and comprehensive nature of the CSCE process, are Western-inspired.

12. Prospects are now brighter than ever before for lasting, qualitative improvements in the East-West relationship. There continue to be clear signs of change in the internal and external policies of the Soviet Union and of some of its Allies. The Soviet leadership has stated that ideological competition should play no part in inter-state relations. Soviet acknowledgement of serious shortcomings in its past approaches to international as well as domestic issues creates opportunities for progress on fundamental political problems.

13. At the same time, serious concerns remain. The ambitious Soviet reform programme, which the Allies welcome, will take many years to complete. Its success cannot be taken for granted given the magnitude of the problems it faces and the resistance generated. In Eastern Europe, progress in constructive reform is still uneven and the extent of these reforms remains to be determined. Basic human rights still need to be firmly anchored in law and practice, though in some Warsaw Pact countries improvements are underway. Although the WTO has recently announced and begun unilateral reductions in some of its forces, the Soviet Union continues to deploy military forces and to maintain a pace of military production in excess of legitimate defensive requirements. Moreover, the geo-strategic realities favour the geographically contiguous Soviet-dominated WTO as against the geographically separated democracies of the North Atlantic Alliance. It has long been an objective of the Soviet Union to weaken the links between the European and North American members of the Alliance.

14. We face an immediate future that is promising but still uncertain. The Allies and the East face both a challenge and an opportunity to capitalise on present conditions in order to increase mutual security. The progress recently made in East-West relations has given new impetus to the arms control process and has enhanced the possibilities of achieving the Alliance's arms control objectives, which complement the other elements of the Alliance's security policy.

### III. PRINCIPLES OF ALLIANCE SECURITY

15. Alliance security policy aims to preserve peace in freedom by both political means and the maintenance of a military capability sufficient to prevent war and to provide for effective defence. The fact that the Alliance has for forty years safeguarded peace in Europe bears witness to the success of this policy.

16. Improved political relations and the progressive development of cooperative structures between Eastern and Western countries are important components of Alliance policy. They can enhance mutual confidence, reduce the risk of misunderstanding, ensure that there are in place reliable arrangements for crisis management so that tensions can be defused, render the situation in Europe more open and predictable, and encourage the development of wider cooperation in all fields.



17. In underlining the importance of these facts for the formulation of Alliance policy, the Allies reaffirm that, as stated in the Harmel Report, the search for constructive dialogue and cooperation with the countries of the East, including arms control and disarmament, is based on political solidarity and adequate military strength.

18. Solidarity among the Alliance countries is a fundamental principle of their security policy. It reflects the indivisible nature of their security. It is expressed by the willingness of each country to share fairly the risks, burdens and responsibilities of the common effort as well as its benefits. In particular, the presence in Europe of the United States' conventional and nuclear forces and of Canadian forces demonstrates that North American and European security interests are inseparably bound together.

19. From its inception the Alliance of Western democracies has been defensive in purpose. This will remain so. **None of our weapons will ever be used except in self-defence.** The Alliance does not seek military superiority nor will it ever do so. Its aim has always been to prevent war and any form of coercion and intimidation.

20. Consistent with the Alliance's defensive character, its strategy is one of deterrence. Its objective is to convince a potential aggressor before he acts that he is confronted with a risk that outweighs any gain - however great - he might hope to secure from his aggression. The purpose of this strategy defines the means needed for its implementation.

21. In order to fulfil its strategy, the Alliance must be capable of responding appropriately to any aggression and of meeting its commitment to the defence of the frontiers of its members' territory. For the foreseeable future, deterrence requires an appropriate mix of adequate and effective nuclear and conventional forces which will continue to be kept up to date where necessary; for it is only by their evident and perceived capability for effective use that such forces and weapons deter.

22. **Conventional forces make an essential contribution to deterrence.** The elimination of asymmetries between the conventional forces of East and West in Europe would be a major breakthrough, bringing significant benefits for stability and security. Conventional defence alone cannot, however, ensure deterrence. Only the nuclear element can confront an aggressor with an unacceptable risk and thus plays an indispensable role in our current strategy of war prevention.

23. The fundamental purpose of nuclear forces - both strategic and sub-strategic - is political: to preserve the peace and to prevent any kind of war. Such forces contribute to deterrence by demonstrating that the Allies have the military capability and the political will to use them, if necessary, in response to aggression. Should aggression occur, the aim would be to restore deterrence by inducing the aggressor to reconsider his decision, to terminate his attack and to withdraw and thereby to restore the territorial integrity of the Alliance.



24. Conventional and nuclear forces, therefore, perform different but complementary and mutually reinforcing roles. Any perceived inadequacy in either of these two elements, or the impression that conventional forces could be separated from nuclear, or sub-strategic from strategic nuclear forces, might lead a potential adversary to conclude that the risks of launching aggression might be calculable and acceptable. No single element can, therefore, be regarded as a substitute compensating for deficiencies in any other.

25. For the foreseeable future, there is no alternative strategy for the prevention of war. The implementation of this strategy will continue to ensure that the security interests of all Alliance members are fully safeguarded. The principles underlying the strategy of deterrence are of enduring validity. Their practical expression in terms of the size, structure and deployment of forces is bound to change. As in the past, these elements will continue to evolve in response to changing international circumstances, technological progress and developments in the scale of the threat - in particular, in the posture and capabilities of the forces of the Warsaw Treaty Organization.

26. Within this overall framework, strategic nuclear forces provide the ultimate guarantee of deterrence for the Allies. They must be capable of inflicting unacceptable damage on an aggressor state even after it has carried out a first strike. Their number, range, survivability and penetration capability need to ensure that a potential aggressor cannot count on limiting the conflict or regarding his own territory as a sanctuary. The strategic nuclear forces of the United States provide the cornerstone of deterrence for the Alliance as a whole. The independent nuclear forces of the United Kingdom and France fulfil a deterrent role of their own and contribute to the overall deterrence strategy of the Alliance by complicating the planning and risk assessment of a potential aggressor.

27. Nuclear forces below the strategic level provide an essential political and military linkage between conventional and strategic forces and, together with the presence of Canadian and United States forces in Europe, between the European and North American members of the Alliance. The Allies' sub-strategic nuclear forces are not designed to compensate for conventional imbalances. The levels of such forces in the integrated military structure nevertheless must take into account the threat - both conventional and nuclear - with which the Alliance is faced. Their role is to ensure that there are no circumstances in which a potential aggressor might discount the prospect of nuclear retaliation in response to military action. Nuclear forces below the strategic level thus make an essential contribution to deterrence.

28. The wide deployment of such forces among countries participating in the integrated military structure of the Alliance, as well as the arrangements for consultation in the nuclear area among the Allies concerned, demonstrates solidarity and willingness to share nuclear roles and responsibilities. It thereby helps to reinforce deterrence.

29. Conventional forces contribute to deterrence by demonstrating the Allies' will to defend themselves and by minimising the risk that a potential aggressor could anticipate a quick and easy victory or limited territorial gain achieved solely by conventional means.

30. They must thus be able to respond appropriately and to confront the aggressor immediately and as far forward as possible with the necessary resistance to compel him to end the conflict and to withdraw or face possible recourse to the use of nuclear weapons by the Allies. The forces of the Allies must be deployed and equipped so as to enable them to fulfil this role at all times. Moreover, since the Alliance depends on reinforcements from the North American continent, it must be able to keep open sea and air lines of communication between North America and Europe.

31. All member countries of the Alliance strongly favour a comprehensive, effectively verifiable, global ban on the development, production, stockpiling and use of chemical weapons. Chemical weapons represent a particular case, since the Alliance's overall strategy of war prevention, as noted earlier, depends on an appropriate mix of nuclear and conventional weapons. Pending the achievement of a global ban on chemical weapons, the Alliance recognises the need to implement passive defence measures. A retaliatory capability on a limited scale is retained in view of the Soviet Union's overwhelming chemical weapons capability.

32. The Allies are committed to maintaining only the minimum level of forces necessary for their strategy of deterrence, taking into account the threat. There is, however, a level of forces, both nuclear and conventional, below which the credibility of deterrence cannot be maintained. In particular, the Allies have always recognised that the removal of all nuclear weapons from Europe would critically undermine deterrence strategy and impair the security of the Alliance.

33. The Alliance's defence policy and its policy of arms control and disarmament are complementary and have the same goal: to maintain security at the lowest possible level of forces. There is no contradiction between defence policy and arms control policy. It is on the basis of this fundamental consistency of principles and objectives that the comprehensive concept of arms control and disarmament should be further developed and the appropriate conclusions drawn in each of the areas of arms control.

#### **IV. ARMS CONTROL AND DISARMAMENT: PRINCIPLES AND OBJECTIVES**

34. Our vision for Europe is that of an undivided continent where military forces only exist to prevent war and to ensure self-defence, as has always been the case for the Allies, not for the purpose of initiating aggression or for political or military intimidation. Arms control can contribute to the realisation of that vision as an integral part of the Alliance's security policy and of our overall approach to East-West relations.

35. The goal of Alliance arms control policy is to enhance security and stability. To this end, the Allies' arms control initiatives seek a balance at a lower level of forces and armaments through negotiated agreements and, as appropriate, unilateral actions, recognising that

arms control agreements are only possible where the negotiating partners share an interest in achieving a mutually satisfactory result. The Allies' arms control policy seeks to remove destabilising asymmetries in forces or equipment. It also pursues measures designed to build mutual confidence and to reduce the risk of conflict by promoting greater transparency and predictability in military matters.

36. In enhancing security and stability, arms control can also bring important additional benefits for the Alliance. Given the dynamic aspects of the arms control process, the principles and results embodied in one agreement may facilitate other arms control steps. In this way arms control can also make possible further reductions in the level of Alliance forces and armaments, consistent with the Alliance's strategy of war prevention. Furthermore, as noted in Chapter II, arms control can make a significant contribution to the development of more constructive East-West relations and of a framework for further cooperation within a more stable and predictable international environment. Progress in arms control can also enhance public confidence in and promote support for our overall security policy.

### Guiding Principles for Arms Control

37. The members of the Alliance will be guided by the following principles:

- **Security:** Arms control should enhance the security of all Allies. Both during the implementation period and following implementation, the Allies' strategy of deterrence and their ability to defend themselves, must remain credible and effective. Arms control measures should maintain the strategic unity and political cohesion of the Alliance, and should safeguard the principle of the indivisibility of Alliance security by avoiding the creation of areas of unequal security. Arms control measures should respect the legitimate security interests of all states and should not facilitate the transfer or intensification of threats to third party states or regions.
- **Stability:** Arms control measures should yield militarily significant results that enhance stability. To promote stability, arms control measures should reduce or eliminate those capabilities which are most threatening to the Alliance. Stability can also be enhanced by steps that promote greater transparency and predictability in military matters. Military stability requires the elimination of options for surprise attack and for large-scale offensive action. Crisis stability requires that no state has forces of a size and configuration which, when compared with those of others, could enable it to calculate that it might gain a decisive advantage by being the first to resort to arms. Stability also requires measures which discourage destabilising attempts to re-establish military advantage through the transfer of resources to other types of armament. Agreements must lead to final results that are both balanced and ensure equality of rights with respect to security.

- **Verifiability:** Effective and reliable verification is a fundamental requirement for arms control agreements. If arms control is to be effective and to build confidence, the verifiability of proposed arms control measures must, therefore, be of central concern for the Alliance. Progress in arms control should be measured against the record of compliance with existing agreements. Agreed arms control measures should exclude opportunities for circumvention.

### **Alliance Arms Control Objectives**

38. In accordance with the above principles, the Allies are pursuing an ambitious arms control agenda for the coming years in the nuclear, conventional and chemical fields.

### **Nuclear Forces**

39. The INF Agreement represents a milestone in the Allies' efforts to achieve a more secure peace at lower levels of arms. By 1991, it will lead to the total elimination of all United States and Soviet intermediate range land-based missiles, thereby removing the threat which such Soviet systems presented to the Alliance. Implementation of the agreement, however, will affect only a small proportion of the Soviet nuclear armoury, and the Alliance continues to face a substantial array of modern and effective Soviet systems of all ranges. The full realisation of the Alliance agenda thus requires that further steps be taken.

### **Strategic Nuclear Forces**

40. Soviet strategic systems continue to pose a major threat to the whole of the Alliance. Deep cuts in such systems are in the direct interests of the entire Western Alliance, and therefore their achievement constitutes a priority for the Alliance in the nuclear field.

41. The Allies thus fully support the United States objectives of achieving, within the context of the Strategic Arms Reduction Talks, fifty percent reductions in United States and Soviet strategic nuclear arms. United States proposals seek to enhance stability by placing specific restrictions on the most destabilising elements of the threat - fast flying ballistic missiles, throw-weight and, in particular, Soviet heavy ICBMs. The proposals are based on the need to maintain the deterrent credibility of the remaining United States strategic forces which would continue to provide the ultimate guarantee of security for the Alliance as a whole; and therefore on the necessity to keep such forces effective. Furthermore, the United States is holding talks with the Soviet Union on defence and space matters in order to ensure that strategic stability is enhanced.



### **Sub-Strategic Nuclear Forces**

42. The Allies are committed to maintaining only the minimum number of nuclear weapons necessary to support their strategy of deterrence. In line with this commitment, the members of the integrated military structure have already made major unilateral cuts in their sub-strategic nuclear armoury. The number of land-based warheads in Western Europe has been reduced by over one-third since 1979 to its lowest level in over 20 years. Updating where necessary of their sub-strategic systems would result in further reductions.

43. The Allies continue to face the direct threat posed to Europe by the large numbers of shorter-range nuclear missiles deployed on Warsaw Pact territory and which have been substantially upgraded in recent years. Major reductions in Warsaw Pact systems would be of overall value to Alliance security. One of the ways to achieve this aim would be by tangible and verifiable reductions of American and Soviet land-based nuclear missile systems of shorter range leading to equal ceilings at lower levels.

44. But the sub-strategic nuclear forces deployed by member countries of the Alliance are not principally a counter to similar systems operated by members of the WTO. As is explained in Chapter III, sub-strategic nuclear forces fulfil an essential role in overall Alliance deterrence strategy by ensuring that there are no circumstances in which a potential aggressor might discount nuclear retaliation in response to his military action.

45. The Alliance reaffirms its position that for the foreseeable future there is no alternative to the Alliance's strategy for the prevention of war, which is a strategy of deterrence based upon an appropriate mix of adequate and effective nuclear and conventional forces which will continue to be kept up to date where necessary. Where nuclear forces are concerned, land-, sea-, and air-based systems, including ground-based missiles, in the present circumstances and as far as can be foreseen will be needed in Europe.

46. In view of the huge superiority of the Warsaw Pact in terms of short-range nuclear missiles, the Alliance calls upon the Soviet Union to reduce unilaterally its short-range missile systems to the current levels within the integrated military structure.

47. The Alliance reaffirms that at the negotiations on conventional stability it pursues the objectives of:

- the establishment of a secure and stable balance of conventional forces at lower levels;
- the elimination of disparities prejudicial to stability and security; and
- the elimination as a matter of high priority of the capability for launching surprise attack and for initiating large-scale offensive action.

48. In keeping with its arms control objectives formulated in Reykjavik in 1987 and reaffirmed in Brussels in 1988, the Alliance states that one of its highest priorities in nego-



tiations with the East is reaching an agreement on conventional force reductions which would achieve the objectives above. In this spirit, the Allies will make every effort, as evidenced by the outcome of the May 1989 Summit, to bring these conventional negotiations to an early and satisfactory conclusion. The United States has expressed the hope that this could be achieved within six to twelve months. Once implementation of such an agreement is underway, the United States, in consultation with the Allies concerned, is prepared to enter into negotiations to achieve a partial reduction of American and Soviet land-based nuclear missile forces of shorter range to equal and verifiable levels. With special reference to the Western proposals on CFE tabled in Vienna, enhanced by the proposals by the United States at the May 1989 Summit, the Allies concerned proceed on the understanding that negotiated reductions leading to a level below the existing level of their SNF missiles will not be carried out until the results of these negotiations have been implemented. Reductions of Warsaw Pact SNF systems should be carried out before that date.

49. As regards the sub-strategic nuclear forces of the members of the integrated military structure, their level and characteristics must be such that they can perform their deterrent role in a credible way across the required spectrum of ranges, taking into account the threat - both conventional and nuclear - with which the Alliance is faced. The question concerning the introduction and deployment of a follow-on system for the Lance will be dealt with in 1992 in the light of overall security developments. While a decision for national authorities, the Allies concerned recognise the value of the continued funding by the United States of research and development of a follow-on for the existing Lance short-range missile, in order to preserve their options in this respect.

### Conventional Forces

50. As set out in the March 1988 Summit statement and in the Alliance's November 1988 data initiative, the Soviet Union's military presence in Europe, at a level far in excess of its needs for self-defence, directly challenges our security as well as our aspirations for a peaceful order in Europe. Such excessive force levels create the risk of political intimidation or threatened aggression. As long as they exist, they present an obstacle to better political relations between all states of Europe. The challenge to security is, moreover, not only a matter of the numerical superiority of WTO forces. WTO tanks, artillery and armoured troop carriers are concentrated in large formations and deployed in such a way as to give the WTO a capability for surprise attack and large-scale offensive action. Despite the recent welcome publication by the WTO of its assessment of the military balance in Europe, there is still considerable secrecy and uncertainty about its actual capabilities and intentions.

51. In addressing these concerns, the Allies' primary objectives are to establish a secure and stable balance of conventional forces in Europe at lower levels, while at the same time creating greater openness about military organisation and activities in Europe.

52. In the Conventional Forces in Europe (CFE) talks between the 23 members of the two alliances, the Western Allies are proposing:

- reductions to an overall limit on the total holdings of armaments in Europe, concentrating on the most threatening systems, i.e. those capable of seizing and holding territory;
- a limit on the proportion of these total holdings belonging to any one country in Europe (since the security and stability of Europe require that no state exceed its legitimate needs for self-defence);
- a limit on stationed forces (thus restricting the forward deployment and concentration of Soviet forces in Eastern Europe); and,
- appropriate numerical sub-limits on forces which will apply simultaneously throughout the Atlantic to the Urals area.

These measures, taken together, will necessitate deep cuts in the WTO conventional forces which most threaten the Alliance. The resulting reductions will have to take place in such a way as to prevent circumvention, e.g. by ensuring that the armaments reduced are destroyed or otherwise disposed of. Verification measures will be required to ensure that all states have confidence that entitlements are not exceeded.

53. These measures alone, however, will not guarantee stability. The regime of reductions will have to be backed up by additional measures which should include measures of transparency, notification and constraint applied to the deployment, storage, movement and levels of readiness and availability of conventional forces.

54. In the CSBM negotiations, the Allies aim to maintain the momentum created by the successful implementation of the Stockholm Document by proposing a comprehensive package of measures to improve:

- transparency about military organisation,
- transparency and predictability of military activities,
- contacts and communication,

and have also proposed an exchange of views on military doctrine in a seminar setting.

55. The implementation of the Allies' proposals in the CFE negotiations and of their proposals for further confidence- and security-building measures would achieve a quantum improvement in European security. This would have important and positive consequences for Alliance policy both in the field of defence and arms control. The outcome of the CFE

negotiations would provide a framework for determining the future Alliance force structure required to perform its fundamental task of preserving peace in freedom. In addition, the Allies would be willing to contemplate further steps to enhance stability and security if the immediate CFE objectives are achieved - for example, further reductions or limitations of conventional armaments and equipment, or the restructuring of armed forces to enhance defensive capabilities and further reduce offensive capabilities.

56. The Allies welcome the declared readiness of the Soviet Union and other WTO members to reduce their forces and adjust them towards a defensive posture and await implementation of these measures. This would be a step in the direction of redressing the imbalance in force levels existing in Europe and towards reducing the WTO capability for surprise attack. The announced reductions demonstrate the recognition by the Soviet Union and other WTO members of the conventional imbalance, long highlighted by the Allies as a key problem of European security.

### **Chemical Weapons**

57. The Soviet Union's chemical weapons stockpile poses a massive threat. The Allies are committed to conclude, at the earliest date, a worldwide, comprehensive and effectively verifiable ban on all chemical weapons.

58. All Alliance states subscribe to the prohibitions contained in the Geneva Protocol for the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare. The Paris Conference on the Prohibition of Chemical Weapons reaffirmed the importance of the commitments made under the Geneva Protocol and expressed the unanimous will of the international community to eliminate chemical weapons completely at an early date and thereby to prevent any recourse to their use.

59. The Allies wish to prohibit not only the use of these abhorrent weapons, but also their development, production, stockpiling and transfer, and to achieve the destruction of existing chemical weapons and production facilities in such a way as to ensure the undiminished security of all participants at each stage in the process. Those objectives are being pursued in the Geneva Conference on Disarmament. Pending agreement on a global ban, the Allies will enforce stringent controls on the export of commodities related to chemical weapons production. They will also attempt to stimulate more openness among states about chemical weapons capabilities in order to promote greater confidence in the effectiveness of a global ban.

## V. CONCLUSIONS :

### **Arms Control and Defence Interrelationships**

60. The Alliance is committed to pursuing a comprehensive approach to security, embracing both arms control and disarmament, and defence. It is important, therefore, to ensure that interrelationships between arms control issues and defence requirements and amongst the various arms control areas are fully considered. Proposals in any one area of arms control must take account of the implications for Alliance interests in general and for other negotiations. This is a continuing process.

61. It is essential that defence and arms control objectives remain in harmony in order to ensure their complementary contribution to the goal of maintaining security at the lowest balanced level of forces consistent with the requirements of the Alliance strategy of war prevention, acknowledging that changes in the threat, new technologies, and new political opportunities affect options in both fields. Decisions on arms control matters must fully reflect the requirements of the Allies' strategy of deterrence. Equally, progress in arms control is relevant to military plans, which will have to be developed in the full knowledge of the objectives pursued in arms control negotiations and to reflect, as necessary, the results achieved therein.

62. In each area of arms control, the Alliance seeks to enhance stability and security. The current negotiations concerning strategic nuclear systems, conventional forces and chemical weapons are, however, independent of one another: the outcome of any one of these negotiations is not contingent on progress in others. However, they can influence one another: criteria established and agreements achieved in one area of arms control may be relevant in other areas and hence facilitate overall progress. These could affect both arms control possibilities and the forces needed to fulfil Alliance strategy, as well as help to contribute generally to a more predictable military environment.

63. The Allies seek to manage the interaction among different arms control elements by ensuring that the development, pursuit and realisation of their arms control objectives in individual areas are fully consistent both with each other and with the Alliance's guiding

principles for effective arms control. For example, the way in which START limits and sub-limits are applied in detail could affect the future flexibility of the sub-strategic nuclear forces of members of the integrated military structure. A CFE agreement would by itself make a major contribution to stability. This would be significantly further enhanced by the achievement of a global chemical weapons ban. The development of confidence- and security-building measures could influence the stabilising measures being considered in connection with the Conventional Forces in Europe negotiations and vice versa. The removal of the imbalance in conventional forces would provide scope for further reductions in the sub-strategic nuclear forces of members of the integrated military structure, though it would not obviate the need for such forces. Similarly, this might make possible further arms control steps in the conventional field.

64. This report establishes the overall conceptual framework within which the Allies will be seeking progress in each area of arms control. In so doing, their fundamental aim will be enhanced security at lower levels of forces and armaments. Taken as a whole, the Allies' arms control agenda constitutes a coherent and comprehensive approach to the enhancement of security and stability. It is ambitious, but we are confident that - with a constructive response from the WTO states - it can be fully achieved in the coming years. In pursuing this goal, the Alliance recognises that it cannot afford to build its security upon arms control results expected in the future. The Allies will be prepared, however, to draw appropriate consequences for their own military posture as they make concrete progress through arms control towards a significant reduction in the scale and quality of the military threat they face. Accomplishment of the Allies' arms control agenda would not only bring great benefits in itself, but could also lead to the expansion of cooperation with the East in other areas. The arms control process itself is, moreover, dynamic: as and when the Alliance reaches agreement in each of the areas set out above, so further prospects for arms control may be opened up and further progress made possible.

65. As noted earlier, the Allies' vision for Europe is that of an undivided continent where military forces only exist to prevent war and to ensure self-defence; a continent which no longer lives in the shadow of overwhelming military forces and from which the threat of war has been removed; a continent where the sovereignty and territorial integrity of all states are respected and the rights of all individuals, including their right of political choice, are protected. This goal can only be reached by stages: it will require patient and creative endeavour. The Allies are resolved to continue working towards its attainment. The achievement of the Alliance's arms control objectives would be a major contribution towards the realisation of its vision.



## CFE NEGOTIATIONS

**Objectives**

1. The objectives of these negotiations are :
  - the establishment of a secure and stable balance of conventional forces at lower levels;
  - the elimination of disparities prejudicial to stability and security;
  - the elimination, as a matter of high priority, of the capability for launching surprise attack and for initiating large-scale offensive action.

2. Through the proposals set out below, the Delegations of Belgium, Canada, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Turkey, the United Kingdom and the United States seek to establish a situation in which surprise attack and large-scale offensive action are no longer credible options. We pursue this aim on the basis of equal respect for the security interests of all. Our proposals make up a coherent whole and are intended to be applied simultaneously and in their totality in the area of application, as defined in the mandate.

**Rationale**

3. The rationale for our proposals is as follows :

- the present concentration of forces in the area from the Atlantic to the Urals is the highest ever known in peace-time and represents the greatest destructive potential ever assembled. Overall levels of forces, particularly those relevant to surprise attack and offensive action such as tanks, artillery and armoured troop carriers, must therefore be radically reduced. It is the substantial disparity in the numbers of these systems, all capable of rapid mobility and high firepower, which most threatens stability in Europe. These systems are also central to the seizing and holding of territory, the prime aim of any aggressor;
- no one country should be permitted to dominate Europe by force of arms: no participants should therefore possess more than a fixed proportion of the total holdings of all participants in each category of armaments, commensurate with its needs for self defence;
- addressing the overall number and nationality of forces will not by itself affect the stationing of armaments outside national borders: additional limits will also be needed on forces stationed on other countries' territory;
- we need to focus on both the levels of armaments and state of readiness of forces in those areas where the concentration of such forces is greatest, as well as to prevent redeployment of forces withdrawn from one part of the area of application to another. It will therefore be necessary to apply a series of interlocking sub-limits covering forces throughout the area, together with further limits on armaments in active units.

**Proposals**

4. We propose the following specific measures within the area of application

**Rule 1 : Overall Limit**

The overall total of weapons in each of the three categories identified below will at no time exceed

main battle tanks	40,000
artillery pieces	33,000
armoured troop carriers	56,000

**Rule 2 : Sufficiency**

No one country may retain more than 30 per cent of the overall limits in these three categories, i.e.

main battle tanks	12,000
artillery pieces	10,000
armoured troop carriers	16,800

**Rule 3 : Stationed Forces**

Among countries belonging to a treaty of Alliance neither side will station armaments outside national territory in active units exceeding the following levels :

main battle tanks	3,200
artillery pieces	1,700
armoured troop carriers	6,000

**Rule 4 : Sub-limits**

In the areas indicated below, each group of countries belonging to the same treaty of Alliance shall not exceed the following levels :

- (1) In the area consisting of Belgium, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Turkey, the United Kingdom, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania and the Territory of the Soviet Union west of the Urals comprising the Baltic, Byelorussian, Carpathian, Moscow, Volga, Ural, Leningrad, Odessa, Kiev, Trans-Caucasus, North Caucasus military districts

main battle tanks	20,000
artillery	16,500
armoured troop carriers	28,000 (of which no more than 12,000 AIFVs)

- (2) In the area consisting of Belgium, Denmark, France, the Federal Republic of Germany, Italy, Luxembourg, the Netherlands, Portugal, Spain, the United Kingdom, Czechoslovakia, the German Democratic Republic, Hungary, Poland and the territory of the Soviet Union west of the Urals comprising the Baltic, Byelorussian, Carpathian, Moscow, Volga, Ural military districts in active units

main battle tanks	11,300
artillery	9,000
armoured troop carriers	20,000

- (3) In the area consisting of Belgium, Denmark, France, the Federal Republic of Germany, Italy, Luxembourg, the Netherlands, the United Kingdom, Czechoslovakia, the German Democratic Republic, Hungary, Poland and the territory of the Soviet Union comprising the Baltic, Byelorussian, Carpathian military districts in active units

main battle tanks	10,300
artillery	7,600
armoured troop carriers	18,000

- (4) In the area consisting of Belgium, the Federal Republic of Germany, Luxembourg, the Netherlands, Czechoslovakia, the German Democratic Republic and Poland in active units :

main battle tanks	8,000
artillery	4,500
armoured troop carriers	11,000

- (5) Rule 4 is to be seen as an integrated whole which will only be applied simultaneously and across the entire area from the Atlantic to the Urals. It will be for the members of each Alliance to decide how they exercise their entitlement under all of these measures.

**Rule 5 : Information Exchange**

Each year holdings of main battle tanks, armoured troop carriers and artillery pieces will be notified, disaggregated down to battalion level. This measure will also apply to personnel in both combat and combat support units. Any change of notified unit structures above battalion level, or any measure resulting in an increase of personnel strength in such units, will be subject to notification, on a basis to be determined in the course of the negotiations.

**Measures for stability, verification and non-circumvention**

5. As an integral part of the agreement, there would be a need for

- stabilising measures : to buttress the resulting reductions in force levels in the Atlantic to the Urals area. These should include measures of transparency, notification and constraint applied to the deployment, movement, storage and levels of readiness of conventional armed forces which include conventional armaments and equipment;
- verification arrangements : to include the exchange of detailed data about forces and deployments with the right to conduct on-site inspection, as well as other measures designed to provide assurance of compliance with the agreed provisions;
- non-circumvention provisions : inter alia, to ensure that the manpower and equipment withdrawn from any one area do not have adverse security implications for any participating state;
- provision for temporarily exceeding the limits set down in Rule 4 for pre-notified exercises.

**The longer term**

6. In the longer term, and in the light of the implementation of the above measures, we would be willing to contemplate further steps to enhance stability and security in Europe such as

- further reductions or limitations of conventional armaments and equipment;
- the restructuring of armed forces to enhance defensive capabilities and further to reduce offensive capabilities.

### CHAPTER 3 - MILITARY LOGISTICS MANAGEMENT SYSTEMS

Central Europe has been described as an area having the world's greatest concentration of military potential<sup>1</sup> and, within NATO's responsibility area of Allied Command Central Europe over 80 million people live there.<sup>2</sup> The region covers the whole of the Federal Republic of Germany and the Benelux countries and is highly industrialized with the benefit of many valuable sea ports and other centres of communication. The border between the Federal Republic of Germany and its two Warsaw Pact neighbours to the East measures approximately 700 kilometres.

The main military shortcoming of NATO's Central Region is its lack of depth. In the North, the distance from the Inner German Border (IGB) to the port of Hamburg is only 50 kilometres; to Bremen 130 kilometres and to the major ports of Rotterdam and Antwerp, approximately 600 kilometres. In the South, at one point, the IGB is only 150 kilometres from the Rhine. It is this factor, coupled with the knowledge that approximately 25% of West Germany's industry and about 30% of its population are located within 100 kilometres of the IGB,<sup>3</sup> which underpins the 'forward defence' rationale of NATO's strategy.<sup>4</sup>

For command and control of operations, the area

closest to the Inner German Border is allocated two army groups: Northern (NORTHAG) and Central (CENTAG) each commanded by a four star general. The army groups also have an associated Allied Tactical Air Force (ATAF), the Second to the North and the Fourth to the South who share the same army group boundaries.<sup>5</sup> See Figure 3.0.

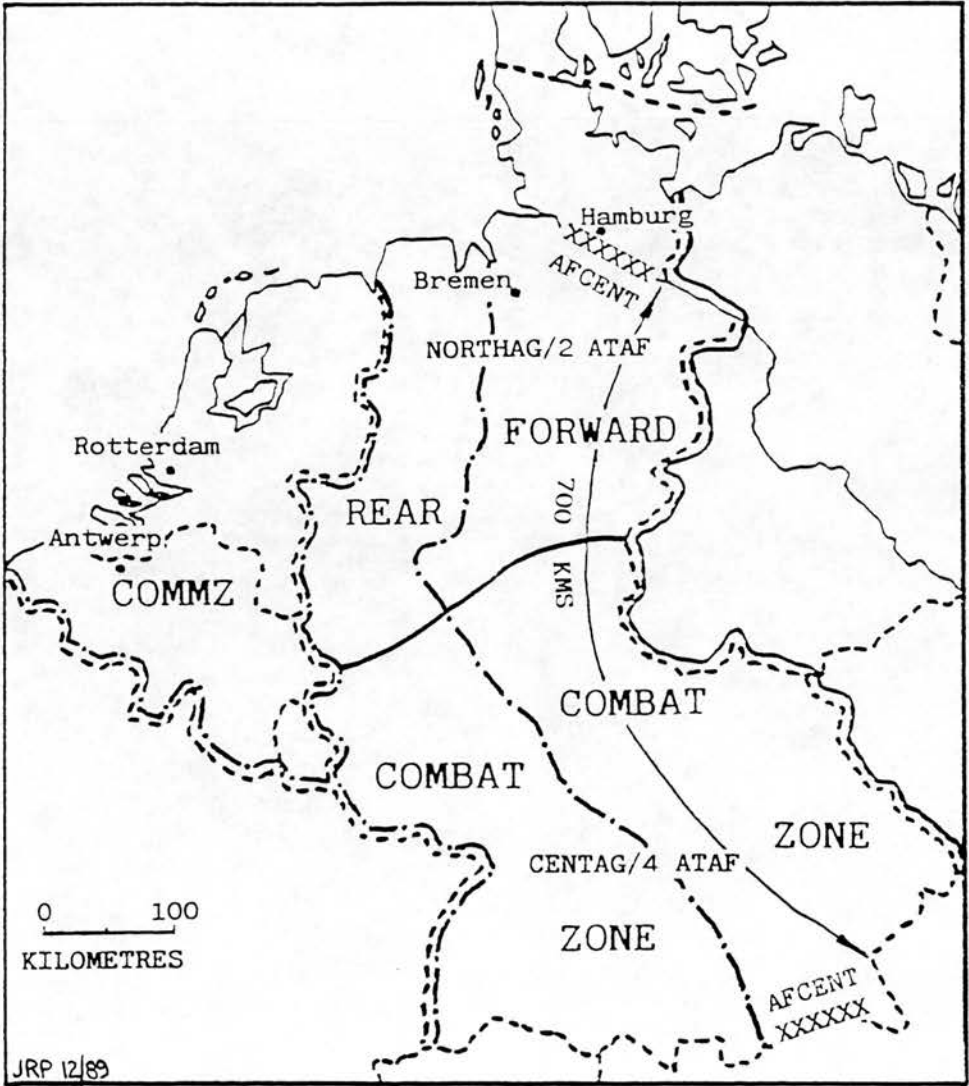


Figure 3.0

Each NATO army group commands four national corps and each of the four corps (three star generals' command), is made up of divisions (two star generals' command), which vary in number from two to four. Each division comprises three brigades and each brigade commands a number of armoured, infantry and allocated artillery units which may be mixed together to form battle groups or combat teams. All the brigades, except those of the UK, have their own organic logistic support troops.

Within the last three years, NORTHAG revised its NATO concept of operations within the broad framework of forward defence and flexible response, from a 'positional defence' to a more flexible system to keep pace with the dynamics of modern highly mechanised warfare. NORTHAG's concept embodies:

Since NATO's adoption of the strategy of forward defence and flexible response in 1967, NORTHAG has planned to fight its defensive battle as far to the East as possible, and has adopted a defensive plan to defeat the enemy by wearing down the impetus of an attack. But continuing improvements in Soviet firepower and developments in operational concepts have led us to reconsider these tactics. Soviet military doctrine places great emphasis on the concentration of forces to achieve surprise and local superiority, and the Soviet Operational Manoeuvre Groups are intended to exploit initial breakthroughs and penetrate rapidly into NATO's rear areas. Faced with these developments, NORTHAG's static

defence began to look increasingly brittle. A revised concept for the defence of the area was therefore prepared, and has now been approved by NATO and by the national authorities of the countries concerned. The revised concept places greater emphasis on the selection of defence of vital areas; on cooperation between ground and air forces; on tactical flexibility and mobility; and in the employment of reserves.

Indeed, a key element of this plan is a considerable strengthening of the armoured reserve forces available to NORTHAG. It is important to recognize that the concept does not mark any change in NATO's essentially defensive posture; nor does it imply any abandonment of the principle of forward defence, which remains a fundamental tenet of NATO strategy. But it does recognise that force improvements permit the adoption of a more mobile tactical concept. Static defence can lead only to a war of attrition, while the new concept would allow the defenders to seize the initiative from the aggressor, giving the Alliance a much better chance of defeating the enemy, rather than merely delaying him.<sup>6</sup>

The concept means that combat arms in the Central Region, including the 1st British Corps, are having to adapt themselves to a mobile battle, mechanized to a greater extent than hitherto. This, in turn, will place far greater demands upon battlefield logistics systems than ever before because "mechanized force stands or falls by the mobility it attains".<sup>7</sup>

In NATO's Central Region of today, a mix of nations each supply their own countries troops on the 'logistics is a national responsibility'<sup>8</sup> basis using re-supply



loops extending from the rear forward. This system has been aptly described as "the umbilical cord of administrative movement",<sup>9</sup> which tends to be based upon historical experience and methods developed in the First World War with seemingly little modification. It has been recorded that:

Strategy and Tactics, in their art and practice, change slowly; but Supply, in its systems, much more so. For a system is invented, evolved, or adapted, and remains for so long the academically correct thing that it is never questioned, its efficiency is never doubted. It lasts for several generations; it grows old. Still, the soldier accepts it. Its immance is too fixed; it is sacrosanct.<sup>10</sup>

It is surprising to note that the above comment was written some fifty-one years ago. Yet today, in spite of the concept of a more mobile tactical strategy, the logistic supply systems of many NATO nations in the central region is still based upon the 'umbilical cord' principle.

The depth of NATO's defensive territory is divided into zones linked to responsibility levels mentioned in Chapter 1, and these are important within the context of this paper. They are, from West to East (see Figure 3.0):

- Communications Zone (COMMZ),<sup>11</sup> which is the area from the North Sea to the border of Germany, including both Belgium and the Netherlands.
- Combat Zone (CZ),<sup>12</sup> the Army Groups' responsibility, covering the area within Germany from the borders of the Netherlands, Belgium and France; Eastwards to the IGB and border with Czechoslovakia.

The Combat Zone is further divided approximately into halves to make up the:

- Rear Combat Zone (RCZ),<sup>13</sup> the Western side of Germany to the borders of the Netherlands, Belgium, Luxembourg and France.
- Forward Combat Zone (FCZ),<sup>14</sup> the Eastern side of Germany to the IGB and the Czechoslovakian border.

The Forward Combat Zone is also known as the Corps Area as each national Corps will deploy its divisions and be responsible for its defence within boundaries. The Rear Combat Zone is used to provide rear support facilities for some Corps; but troops of the German Territorial Command are responsible for its security.

See the schematic diagram at Figure 3.1:

Communication Zone	Rear Combat Zone/ Rear Army Group Area	Rear Corps Area	Rear Division Area	Brigade Area
			Division Area	
		Forward Combat Zone		
	Combat Zone			

Figure 3.1

(Source: NATO Land Forces Logistic Doctrine ALP-9,  
(First Draft, September 1989).

Logistic support for Allied forces is, in general, allocated by national authorities to responsibility levels at Commands in the COMMZ, RCZ or FCZ as appropriate. However, systems vary according to nationality; a significant factor when efficiency, mobility, flexibility and cooperation are essential for joint allied operations.<sup>15</sup> Although the term logistics has been defined in Chapter 1 and further narrowed down to production logistics and consumer logistics; the most important to the field soldier are those logistics which enable troops to survive, to move and

to fight. These can be identified as:

- Combat supplies i.e. ammunition, fuel and rations.
- Battlefield repair and recovery of both equipment and personnel.

The following words by the former General Officer Commanding the US Army Logistics Center, Fort Lee, Virginia are relevant:

Support for the combat forces begins at the edge of the combat battlefield where direct support to combat elements is provided. This is by far the most important place in the logistic system - all elements support it.<sup>16</sup>

\* \* \*

In view of the importance of logistics to the fighting troops, an observer could be forgiven for thinking that procedures at the vital battlefield interface in Allied Command Europe would be almost identical. Eight Army Corps, provided by five nations,<sup>17</sup> deployed side by side in a comparatively small area with little depth, under one command against a common threat, would perhaps substantiate this view. However, the agreement that the "provision of logistic resources

to meet NATO operational plans is a national responsibility"<sup>18</sup> has permitted countries to develop their own systems.

The lack of uniformity in battlefield logistics is only one result stemming from the logistics is a national responsibility rule.<sup>19</sup> More serious, within a systems context, is the leeway provided for nations to design and tailor their own logistics to support their national NATO assigned troops. As briefly mentioned in Chapter 1, when military budgets are reduced, an obvious solution is for governments to cut the "tail" in preference to the more highly visible "teeth".<sup>20</sup> This action not only maintains the "shop window"<sup>21</sup> aspect of deterrence, but also reassures the taxpayers and voters. As a result of financial squeezing, some nations systems have been eroded or redesigned to a level that their efficiency under combat conditions would be questionable. However, as the systems are never truly independently tested,<sup>22</sup> some national logistics shortcomings remain under the cover of the three blankets: not disturbing the country's voters; not upsetting NATO Allies; and not projecting any sign other than a credible deterrent posture. In this respect NATO commanders' primary aim is to deter war.<sup>23</sup>

Economic constraints are not the only factors



which lead to differing logistics systems. Historical experience, geography and varying perceptions of the threat all lend themselves to different responses. The Navy saying from the days of sail - "different ships, different longsplices" is quite appropriate for the six nations deployed to defend NATO's Central Region.<sup>24</sup> Where a sailing ship may have been efficient with its splices running through its own blocks; it would not have been possible to expect another vessel's spliced rope to run through its sheaves, as size and angle of pull are involved.<sup>25</sup> It all becomes a question of interoperability:

The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together.<sup>26</sup>

It will be appreciated that the importance of interoperability is heightened when resources become scarce. But this is the situation in the Central Region today; both limited resources<sup>27</sup> and limited interoperability<sup>28</sup> and this is addressed separately in Chapters 4 and 5.

It has been noted that economics, geography, historical experience and threat perception assists in shaping a nation's military logistics system. The United States, with its worldwide orientation, an apparent sufficiency of resources (the economic factor)

and a tightly controlled decision-making process has a different view to the West Germans, who only have a Central Europe mission. The German Forces live, work and will fight in their own country so, naturally, they give a high priority to civil/military cooperation;<sup>29</sup> and this latter factor assists the economic considerations.

In contrast, the British, who have neither the funds of the US nor the geographic aspects of the Germans, are influenced by economic constraints linked to historical experience. This latter aspect has resulted in a structure-driven system and a peacetime soldiering culture. The Netherlands and Belgium have similar closeness to the threat, but are less influenced by the same historical experiences in developing their logistic systems. Both countries also suffer from limited funding and, in stark comparison to their NATO allies, at least officially agree and declare their deficiency areas.

The following quote by the Professor of History at Texas A & M University is significant:

New analogies, terms and a greater sensitivity of the range of (logistic) functions can serve to offset simplistic teeth-tail images. If the spearhead be set on an unsound shaft, and not firmly welded, then shall it be forged for naught?<sup>30</sup>

It is even more poignant to record that the emblem/

badge of the 1st British Corps incorporates a spear-head set on a very short shaft.<sup>31</sup>

\* \* \*

It has been recorded that British logistic systems have been influenced by economic constraints linked to historical experience. Prior to 1974, logistic support units were organised to provide the following to each brigade<sup>32</sup> in the field:

- Transport Squadron (Royal Corps of Transport)
- Ordnance Company (Royal Army Ordnance Corps)
- Field Workshop Unit (Royal Electrical and Mechanical Engineers)
- Field Ambulance Unit (Royal Army Medical Corps)

These units were affiliated to the brigade and remained under the command of their respective heads of service at division. Brigades were responsible for the detailed management of their own logistics, but within the overall plan laid down by divisional<sup>33</sup> headquarters.

In 1974, a Defence Review was undertaken with the object of saving money and manpower; one result was a restructuring plan for the Army. It removed the brigade level of command and cut operational logistic support, centering command and control of logistics

at division. It was suggested that this was the most appropriate place to ensure balance, flexibility and the efficient use of scarce resources. However, 1981 saw the reintroduction of the brigade level of command; but this did not trigger a return of the hitherto affiliated brigade units. Savings had been made and new concepts adopted which, for logistics, articulated two main principles:

- Logistic resources are commanded and controlled at the highest practical level.<sup>34</sup>
- The commander (of a formation) commands logistic units through the heads of service. This task is usually undertaken on his behalf by the Deputy Chief of Staff.

Although the Northern Army Group's revised concept of operations places the emphasis "to fight a mobile defensive battle"<sup>35</sup> which will demand tactical flexibility and mobility. 1st British Corps brigades the "basic 'fighting' formation",<sup>36</sup> do not have affiliated logistic support units. Instead, they receive a slice of the divisions logistic units assets as and when required.<sup>37</sup> This normally involves the allocation of:

- Immediate Replenishment Groups - a small number of Royal Corps of Transport (RCT) load carrying vehicles tasked to provide Combat Supplies to battle groups. (Push System). Normally allocated one group per battle group.
- Forward Ordnance Team - a small Royal Army Ordnance Corps (RAOC) team tasked to transmit stores demands, resolve problems associated with the resupply of ordnance stores, and act as a transit point for stores when necessary. (Pull System).
- Forward Repair Team - a number of Royal Electrical and Mechanical Engineers (REME) tradesmen capable of major assembly changes to important vehicles.
- Dressing Station - a Royal Army Medical Corps (RAMC) unit capable of giving First Aid and preparing casualties for evacuation with their own ambulances.

The units to which these elements belong remain under divisional command through their own logistic service heads. The main logistic units at division are:



- A transport regiment made up of three transport squadrons.<sup>38</sup>
- An ordnance battalion comprising three ordnance companies.
- Two armoured workshop units; one large and one small, which can collectively form three medium repair groups and three forward repair groups.
- Two field ambulance units, one with tracked ambulances and one with wheeled ambulances. They can collectively form three dressing stations.

The ability to split the four logistic aspects into three separate groups is noteworthy, given that each British division now commands three brigades.

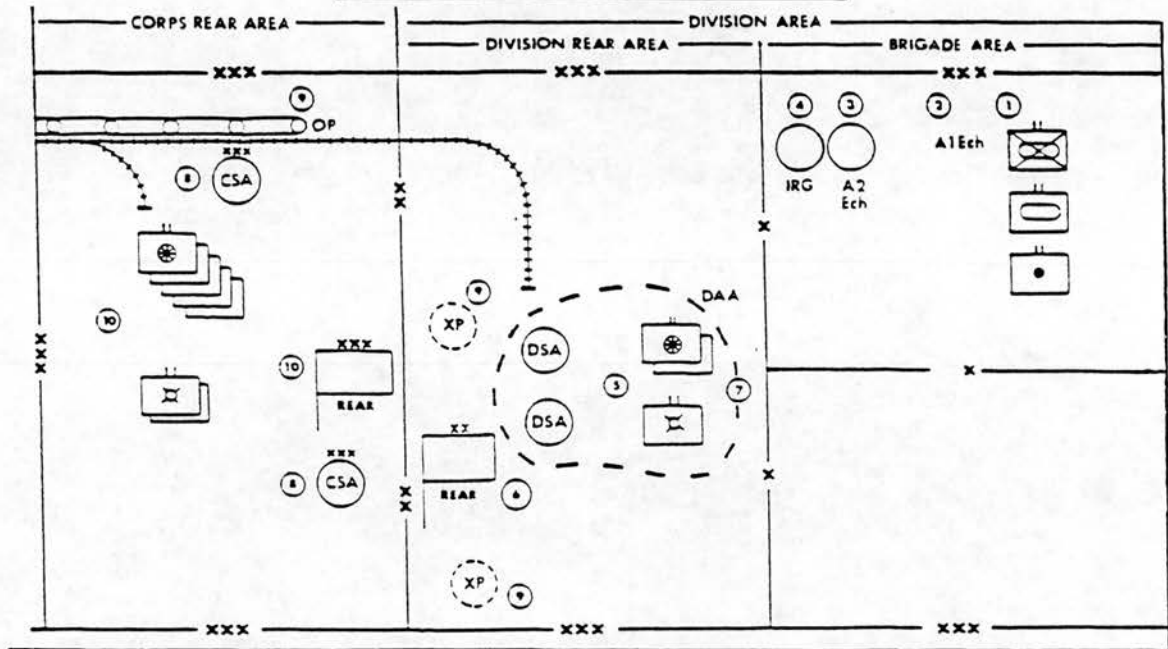
The British system of battlefield logistics support is unique as the provision of the vital Combat Supplies is shared between two logistic corps.<sup>39</sup> RAOC units procure, hold and account for the supplies whenever they are static in warehouses, transit sheds or field dumps; and remain accountable to their cap-badge head. The RCT moves the Combat Supplies forward from RAOC facility to RAOC dumps until the stores are finally delivered to the fighting units. These RCT elements

are responsible in turn to their own logistic corps head. To limit the transport cycle length, RCT units are tasked to cover certain boundaries and become designated; see Figure 3.2:

- 4th line transport (known as support command troops) who move Combat Supplies within the COMMZ and forward to RCZ dumps, normally to a Corps Supply Area (CSA).
- 3rd line transport (known as corps troops) who move the Combat Supplies within the RCZ and forward from the CSA's to the Divisional Supply Areas in the FCZ.
- 2nd line transport (known as divisional troops) who move the Combat Supplies within the FCZ and via their own Immediate Replenishment Groups (IRG's) to the fighting troops.

1st line transport is not RCT manned, but comprises vehicles which belong to armoured regiments or infantry battalions in the brigade areas; and these vehicles are classed A1 or A2 echelon; see Figure 3.2. This description of today's dynamic process could have been extracted from a 1938 publication on British

# SUPPLY SYSTEM OF A BRITISH ARMY CORPS



## Supplements—Explanations

- ① F Echelon consists of the fighting, medical and some fitters' vehicles of a combat unit or battle group.
- ② A1 Echelon carries combat supplies (Classes I, III and V) needed for the immediate battle replenishment of F Echelon. As vehicles empty they are replaced by loaded vehicles from A2 Echelon.
- ③ A2 Echelon carries the remainder of the combat unit's combat supplies.
- ④ The IRC is the most forward logistic replenishment subunit. It consists of a Royal Corps of Transport (RCT) troop with a variable number of loaded vehicles. It is co-located with A2 Echelon in the rear of a combat unit and provides immediate combat supplies support. The IRC is permanently available, delivering forward when required while at the same time calling for loaded replacement vehicles from its parent RCT squadron.
- ⑤ The Divisional Transport Regiment (DTR) commands two or more squadrons. It may be supplemented by a transport regiment from Corps. Squadrons are not organic to brigades but normally affiliated to them. Each Squadron contains a Combat Supplies Platoon (RACC). There are no organic brigade logistic units but a small brigade logistic staff coordinates the logistic requirements of the brigade.
- ⑥ Logistics within the division are controlled by Divisional Rear Headquarters (Div Rear HQ). The DCCS G1/G4 controls Div Rear HQ and plans the logistic support of the division keeping in close contact with the G3 Operations Staff. The Commanders Transport and Supply control the operations of their respective units.
- ⑦ The Divisional Administrative Area (DAA) contains organic logistic units if they are not deployed further forward as part of the logistic plan. The Commander Supply commands the DAA and controls the Divisional Supply Areas (DSA). There will normally be 2-3 DSA per division. These hold grounded stocks of combat supplies and material which are in excess of the division's capacity to hold on wheels. Daily maintenance of the DSAs will normally be by through running trains and vehicles direct from depot in AGL.
- ⑧ Two Corps Supply Areas (CSA) are established in the Corps Rear Area. These are field locations supplied by rail, pipeline and RCT road transport. Each CSA is controlled by an Ordnance Battalion (RACC). CSA stocks of combat supplies and material are held as a buffer.
- ⑨ Should combat supplies have to be moved forward from the CS this will be done by the RCT transport of the third line (Corps) transport regiment allocated in support of a division. Delivery will be either to DSA or divisional RCT squadron locations for distribution through IRCs. Exceptionally if the distance between the CSA and the destination is too great, one or more Exchange Points (XP) may be established near the Divisional Rear Boundary where combat supplies are cross loaded onto divisional transport. XP may also be used by RCT transport. Bulk fuel tankers of the Divisional Transport Regiment pick up their fuel either at a CLEPS depot or field bulk fuel installation established at a CLEPS offtake point (OP). Dumps of Artillery ammunition are established close to gun lines depending on the nature of the battle and the anticipated consumption rates.
- ⑩ Corps logistics are controlled in the Corps Rear HQ by the Brigadier ACOS G1 with the Commanders of the main logistic Corps who commands the transport regiments and the Ordnance Battalions serving the Corps.

Source - NATO's MAS 1989

Figure 3.2

supply with little amendment.<sup>40</sup> It is recorded that before the introduction of Motor Transport, a battalion's A1 and A2 echelons would be approximately 30 horse drawn wagons;<sup>41</sup> but the greater significance is that the ponderous umbilical system has not changed.<sup>42</sup>

One area of inter-mixing transport tasking concerns the movement of artillery ammunition in the FCZ. Because of the vast quantities likely to be used, 3rd line transport can be tasked to back-up the 2nd line transport units in delivering ammunition direct to gun lines via an Ammunition Control Point (ACP). When this occurs, the 3rd line transport unit is detached to and placed under command of the division.

Combat supplies comprises ammunition, fuel and rations. The format outlined in the preceding paragraphs does not necessarily include the movement of fuel as greater reliance is now placed upon bulk transportation. In this respect, the NATO Central Europe Pipeline System (CEPS),<sup>43</sup> provides both storage and transport facilities well forward. Large RCT 22,500 litre low-mobility road tankers fill from CEPS depots or from field tank farms and transfer the fuel to 12,000 litre tankers which in turn top-up fuel pods mounted on 4 or 6 wheel

drive trucks. The fuel vehicles are part of the transport regiments and allocated by size/mobility according to their line role. There is no inhibition in refilling any fuel-carrying vehicle at the nearest CEPS depot;<sup>44</sup> however, the system provides flexibility in trucking fuel forward in the event of a forward CEPS depot becoming inoperable. CEPS depots are manned by NATO staff; field tank farms are run by RAOC personnel.

Two other vital aspects of combat logistics concern the recovery and repair of both equipments and personnel on the battlefield.

The recovery and repair of battlefield equipment is vital to the armies of NATO today as it has been since the inception of mechanised, combined-arms warfare.<sup>45</sup>

In view of the Warsaw Pact's superiority in tanks and guns, a way of maximising the effectiveness of NATO's main battle tank fleet is an effective system of battlefield recovery and repair.<sup>46</sup> This could become a critical factor where the odds are so high. The REME tends to comprise practical engineers who take a pragmatic approach to the principle "logistics are commanded and controlled at the highest practical level".<sup>47</sup> Their two divisional field workshop units are designed to structure into three medium and three forward repair groups. As soon as the battle situation



develops, the REME commander should have little qualms in deploying one medium and one forward repair group to support each of the three brigades of the division. They are not, however, detached to the brigades in peacetime.

The role of the RAMC also involves practical skills and, while the corps stress that casualty estimates are not their responsibility, the following quote is interesting:

It would seem reasonable to expect a battle group in contact to receive 15% casualties in a 6 hour period in NW Europe. If this is the case, the Regimental Aid Post would have difficulty in coping on their own.<sup>48</sup>

The RAMC also feels that in any 100 casualties, 40 are likely to be killed or missing. Of the remaining 60, 10 can be returned to duty after treatment and the remainder will require evacuation, with 24 stretcher and 26 walking or sitting cases.<sup>49</sup> These figures have been included to focus the mind on the importance of combat logistics; however, within the divisions, the two RAMC field ambulance units can deploy three separate dressing stations, one for each brigade, when directed. In peacetime, RAMC units are not affiliated to a particular brigade.

This section has been designed to describe, as

concisely as possible, the combat logistics system employed within the divisions of the 1st British Corps before examining the systems of other ground forces. It seems appropriate at this stage, to quote the meaningful last sentence in The Army Field Manual - The Armoured Division in Battle: "The logistic plan most likely to succeed will be the simplest".<sup>50</sup>

\* \* \*

The allocation of two US Army Corps to the Central Region and a reinforcement Corps whose troops are in America, but equipment stored in Germany<sup>51</sup> represents a significant American commitment to the NATO Alliance. It should, however, be viewed against the background of an Armed Service with wide geographic interests and design principles which include global orientation.<sup>52</sup> The ability to position and support forces almost anywhere in the world, coupled with the stationing of major Army combat formations in Korea, Panama, Alaska and Hawaii, as well as the Continental US and Europe represents comprehensive logistics understanding. It also explains why a significant proportion of the 'few books written on logistics' have been by Americans.<sup>53</sup>

The US Army logistic system at divisional level is coordinated by the divisional support command. Until 1986, this was a brigade-sized logistic formation with

supply and transportation, medical and maintenance battalions which could implement the logistic plan for the brigades of the division. It was a system, similar to the British, founded on the belief that centralised control gives flexibility and adaptability. In practice, it was found impossible to operate direct to brigades without some intermediate logistic cell. As a result, the post of Forward Area Support Coordination Officer was created;<sup>54</sup> the individual was backed up with a Forward Area Support Team comprising elements of the divisional logistic units. These posts were not fully established but merely personnel deployed as a team well forward to improve the logistic service to the brigades.

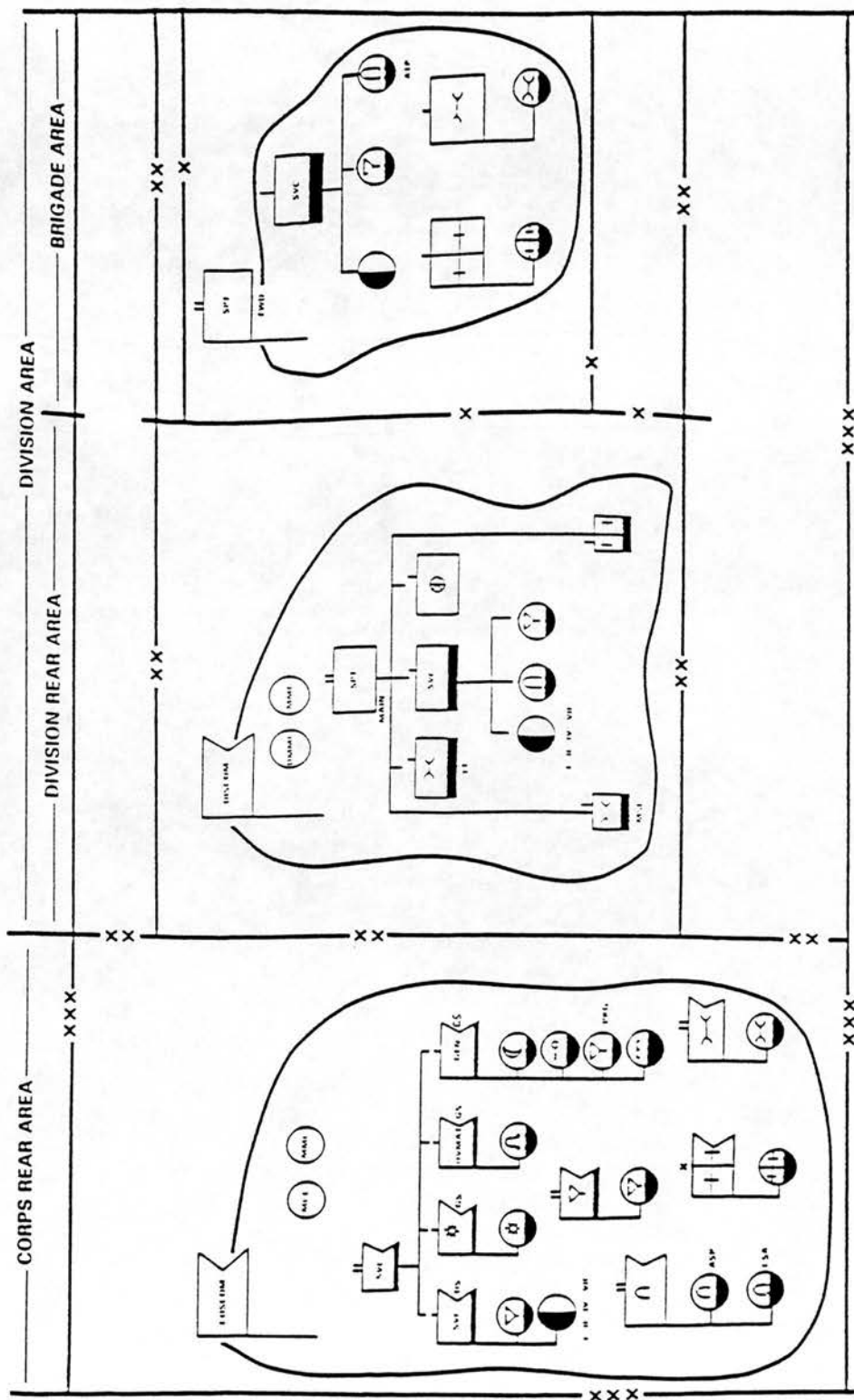
The shortcomings of the above system generated considerable discussions within the United States and a hard-hitting analysis noted that the "arrangement of providing combat service support to brigades in a division is not going to work satisfactorily in combat".<sup>55</sup>

The article recommended that forward support battalions consisting of companies of the supply, medical and maintenance services and a commander and staff be created. One battalion to be allocated to each brigade for immediate support, and a main support battalion including a transportation company

at divisional level giving a wider range of facilities on a routine basis, such as special stores or complicated spares. Surprisingly, these proposals were tried and tested and, in 1986, the US Army adopted the principle of establishing a main support battalion at division with forward support battalions provided for brigades.<sup>56</sup> These units are now operating and the supply units provided within US Army Corps in Europe are shown in the matrix below:

FORMATION	TYPE OF SUPPLY UNITS
<u>BRIGADE</u> X	FORWARD SUPPORT BATTALION: <ul style="list-style-type: none"> <li>- Supply Company</li> <li>- Maintenance Company</li> <li>- Medical Company</li> </ul>
<u>DIVISION</u> XX	DIVISION SUPPORT COMMAND Main Support Battalion: <ul style="list-style-type: none"> <li>- Supply and Service Company</li> <li>- Light Maintenance Company</li> <li>- Heavy Maintenance Company</li> <li>- Missile Support Company</li> <li>- Medical Company</li> <li>- Transportation Motor Transport Company</li> </ul>
<u>CORPS</u> XXX	CORPS SUPPORT COMMAND <ul style="list-style-type: none"> <li>- Supply and Service Battalion</li> <li>- Medical Battalion</li> <li>- Petroleum Battalion</li> <li>- Ordnance (Ammunition) Battalion</li> <li>- Maintenance Battalion</li> </ul>

# SUPPLY SYSTEM OF AN US ARMY CORPS



Source - NATO's MAS 1989

Explanations see over

Figure 3.3



#### Supplementary Explanations

1. Units in the brigade area of operations request Class I, II, III, IV and VII supplies from the Supply Company of the Forward Support Battalion. Class VIII supplies are requested from the medical unit assigned to the battalion and Class IX supplies from the maintenance unit of the battalion. Units in the brigade area draw selected high usage ammunition (such as 155mm) from the ammunition transfer point (ATP) that operates near the supply company. All other ammunition is picked up at the ammunition supply point (ASP) in the Corps. If requested supplies are not on hand at the brigade supply points, the requests are forwarded to the division materiel management center (DMMC). The personnel at the DMMC check their records to see if the supplies are located within the division. If they are, the DMMC directs issue to the user. If the supplies are not on hand within the division, DMMC personnel request them from the Corps MMC.

2. Units in the division rear request Class I, II, III, IV, and VII supplies from the supply and service company of the Main Support Battalion (MSB). Class VIII supplies are requested from the medical company of the MSB. Class IX supplies are obtained from the MSB Light Maintenance Company, except missile items, which are supplied by the MSB Missile Company. Units in the division rear draw selected ammunition from the ATP. All other ammunition must be picked up from the Corps ASP. If requested supplies are not on hand at the divisional supply point, requests are sent to the DMMC or Medical unit for transmittal to the Corps MMC or MEDSOM (Medical Supply, Optical and Maintenance) unit.











In peacetime the Corps MMC serves primarily in an administrative role, processing requisitions for further transmission to the Continental United States (CONUS) supply base. A limited number of high priority requisitions and requisitions for items repaired at Corps or theater level are satisfied by the Corps. In wartime, the Corps General Support Supply Base (GSSB) is the primary source for Class I, II, III, IV, V, VII and non-air delivered (ALOC) Class IX. ALOC Class IX requirements (except for issue priority designators (IPD) 1) will continue to be met from CONUS.

3. Units in the Corps rear draw their supplies from Direct Support (DS) supply points throughout the Corps area. The Supply and Service Company (DS), of the Supply and Service Battalion, provides Class I, II, III, IV, and VII supplies to the requesting units. Class V is provided by the Corps ASP, Class VIII by medical units operating in the Corps. Class IX supplies are provided by the maintenance units of the various maintenance battalions. In addition to the DS supply points supporting the Corps units, there are general supply (GS) units which provide GS supplies and backup to the DS units.

4. Logistics Command and Control. The Corps Support Command (COSCOM) provides maintenance, supply, transportation, health service support, and field services to the corps. Within a corps zone, non-divisional units receive DS and GS supply and maintenance from the COSCOM. Additionally, the COSCOM provides GS and backup DS support to the divisional units. The COSCOM accomplishes its mission through support groups and subordinate DS/GS units. Materiel and maintenance management is accomplished through

the COSCOM materiel management center (MMC); Corps transportation assets are managed by the COSCOM movements control center (MCC). Both management centers are subordinate to COSCOM HQ. The COSCOM MMC, like the DMHC, continuously monitors the operational readiness of weapons systems and takes action to keep them operational.

The division support command (DISCOM) provides direct support supply, maintenance, transportation, medical support, and services to the division. The division support command deals directly with the support groups of the COSCOM on combat service support matters. The DISCOM also maintains a close relationship with the functional control centers (MMC) and (MCC) of the corps. Support to the brigades is generally tailored to the size, mission, and equipment of the brigade. The DISCOM commander, in providing support to the division, uses the Division Materiel Management Center (DMCC) as his primary coordinating and control element. It reviews maintenance priorities to include repair parts, and is geared to returning inoperative weapons systems to combat. The DMHC also coordinates and controls supply operations to move supplies forward and shift support resources to meet the operational needs.

 <p>Class I</p> <p>Subsistence including gratuitous issues of health, morale and welfare items.</p>	 <p>Class II</p> <p>Clothing, individual equipment, tentage, tool sets, administrative and house-keeping supplies and equipment.</p>	 <p>Class III</p> <p>Petroleum, oil and lubricants, compressed gases and coolant.</p>	 <p>Class IV</p> <p>Construction materials.</p>	 <p>Class V</p> <p>Ammunition</p>
 <p>Class VI</p> <p>Personal demand items sold through exchanges (PX).</p>	 <p>Class VII</p> <p>Major end items such as tanks, armored personnel carriers and attack helicopters.</p>	 <p>Class VIII</p> <p>Medical, to include medical peculiar repair parts.</p>	 <p>Class IX</p> <p>Repair parts and components for equipment maintenance.</p>	 <p>Class X</p> <p>Nonstandard items to support non-military programs such as agriculture and economic development.</p>

The utilization of the supply units is shown in schematic form at Figure 3.3, and the points of particular relevance concerning the new system are: first, the combination of supply and transport within one unit at divisional level; second, central logistic coordination at brigade, division and corps level; third, and most importantly, a structure designed specifically to meet the task.<sup>57</sup>

\* \* \*

The Heer - The Federal German Army provides the largest share of NATO land forces in Central Europe comprising 340,000 personnel in peacetime, which would be increased in war to a total of 1,055,000 men.<sup>58</sup> The Army is for administration established into three main elements; the Army Field Forces (Feldheer), the Territorial Army (Territorialheer) and the General Army Office (Heeresamt). The latter essentially provides support to the Army Staff and includes a substantial training organization; but the Field Forces represents those troops "earmarked for assignment to NATO commanders".<sup>59</sup> This force totalling 12 divisions<sup>60</sup> is organized into three Army Corps with the 1st German Corps deployed to NORTHAG; and the 2nd and 3rd German Corps to CENTAG. The Territorial Army comprising some 64,000 personnel remains under national command and is tasked to secure German territory in the Rear

Combat zone and support the Field Forces.

The Federal German Army has well developed logistic plans for the Central Region, including the provision of a large number of host nation support<sup>61</sup> measures for other members of the Alliance. These measures are agreed bi-laterally in peacetime and represent a significant logistic allocation. For example, assistance to US reinforcements includes 18 transportation battalions and 14 security companies.<sup>62</sup> The Federal Army's support to its 1,055,000 troops, together with meeting the demands of host nation support agreements, requires highly developed logistic plans and procedures. This latter aspect was simplified by the formation in 1959, of the Technical Service (Technische Truppe) by amalgamating two services covering supply, transport and repair; in effect forming a single logistic corps. However, the Medical Services (Sanitastruppe) remain a separate corps.

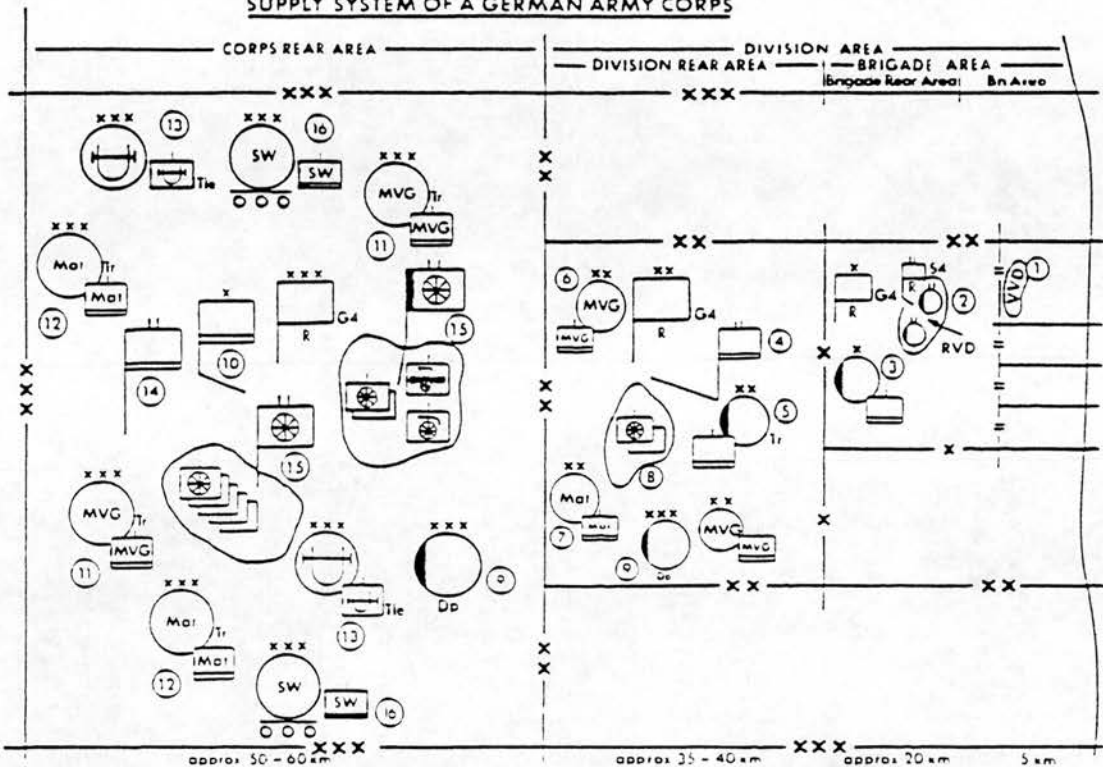
In the field the supply units provided within GE Army Corps are outlined overleaf:

FORMATION	TYPE OF SUPPLY UNITS
<u>BRIGADE</u> X	- Supply Company
<u>DIVISION</u> XX	SUPPLY BATTALION: <ul style="list-style-type: none"> <li>- Supply Company (for div troops)</li> <li>- Supply Company Material</li> <li>- Supply Company Bulk Supplies</li> <li>- Supply Company Bulk Supplies</li> <li>- Transportation Company</li> </ul>
<u>CORPS</u> XXX	CORPS SUPPORT COMMAND <ul style="list-style-type: none"> <li>- Supply Battalion (for corps troops)</li> <li>- Transportation Battalion</li> <li>- Transportation Battalion</li> <li>- Corps Depots</li> </ul>
	CORPS ARTILLERY COMMAND <ul style="list-style-type: none"> <li>- Special Weapons Supply Battalion</li> </ul>

The Brigade Supply Company provides and transports ammunition (except artillery and engineers), fuel, rations, clothing and personal support items, repair parts and a field post office. The two Divisional Supply Companies Bulk Supplies provides ammunition



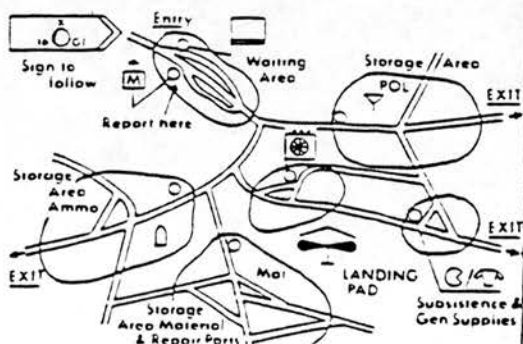
# SUPPLY SYSTEM OF A GERMAN ARMY CORPS



## SUPPLEMENTARY EXPLANATIONS

- ① VVD - FORWARD SUPPORT ELEMENTS of maneuver battalion
- ② RVD - REAR SUPPORT ELEMENTS of maneuver battalions with BATTALION SUPPLY POINT and SN COMMAND POST. Usually the rear support elements of 2 or more battalions are collocated in one area.
- ③ BRIGADE SUPPLY POINT - Subsistence, general supplies and equipment, POL, repair parts, AMMO except artillery ammunition, mines, explosives, etc.
- ④ BN HQ of DIV SUPPLY BN - in charge of all supply points and transportation units within Div REAR AREA
- ⑤ SUPPLY POINT FOR DIVISIONAL UNITS - Subsistence, general supplies and equipment, POL, repair parts, AMMO except artillery and army air defense ammunition, mines and explosives, etc.
- ⑥ DIVISION SUPPLY POINT FOR BULK SUPPLIES - Subsistence, general supplies and equipment, POL, ammunition
- ⑦ DIVISION SUPPLY POINT FOR MATERIAL - Repair parts and selected major end items
- ⑧ TRANSPORTATION UNITS of DIV SUPPLY BN
- ⑨ CORPS DEPOT
- ⑩ CORPS SUPPLY COMMAND - in charge of all supply and transportation units and installations within Corps Rear Area
- ⑪ CORPS SUPPLY POINT FOR BULK SUPPLIES - Subsistence, general supplies and equipment, POL, ammunition
- ⑫ CORPS SUPPLY POINT FOR MATERIAL - Repair parts and selected end items
- ⑬ RAIL TRANSLOADING POINT FOR HEAVY EQUIPMENT
- ⑭ BN of CORPS SUPPLY BN - in charge of all supply points within Corps Rear Area (subordinate to Corps Supply Support Command)
- ⑮ BN HQ of Corps TRANSPORTATION BN (subordinate to Corps Supply Support Command)
- ⑯ SPECIAL WEAPONS SUPPLY BN (subordinate to Corps Artillery Command)

## ORGANIZATION OF A SUPPLY POINT



## General Rules for Initiating Emergency Logistics Assistance

1. Contact SN, BN, J4/Brig, Div, Corps or any HQ of a supply or Transportation Unit.
2. Pick up supplies with own vehicles from assigned supply point. Standard organization of supply point is outlined in sketch to the left.
3. Use NATO-Requisitioning and Loading Bill (LTAHAG 2034)

Source - NATO's MAS 1989

Figure 3.4

support to the brigades as well as divisional units. The formation General Staff are responsible for the planning of the logistics support system, but the deputy commander has a supervisory role in the rear areas. The supply system of a German Army Corps is as shown in schematic form at Figure 3.4 and this system applies to all three of its Army Corps.

Before examining the supply methods of the Dutch and Belgian Corps, emphasis must be placed on the German Army's additional commitment to the Rear Combat Zone.<sup>63</sup> Here, troops of the German Territorial Command which in peacetime numbers 64,000 men, but would be increased in war to nearly half a million,<sup>64</sup> are responsible for security and significant logistic tasks in support of own troops and for the benefit of Alliance as a whole.

\* \* \*

The 1st Netherlands Corps places emphasis on mobility and flexibility to provide the opportunities to react to changing situations. In consequence, its logistic systems have been designed to reflect this overall strategy. It is established with dedicated<sup>65</sup> logistic units at brigade and corps level only; but the Corps Logistic Command creates, with its own organic units, an area support system in the divisional area. The

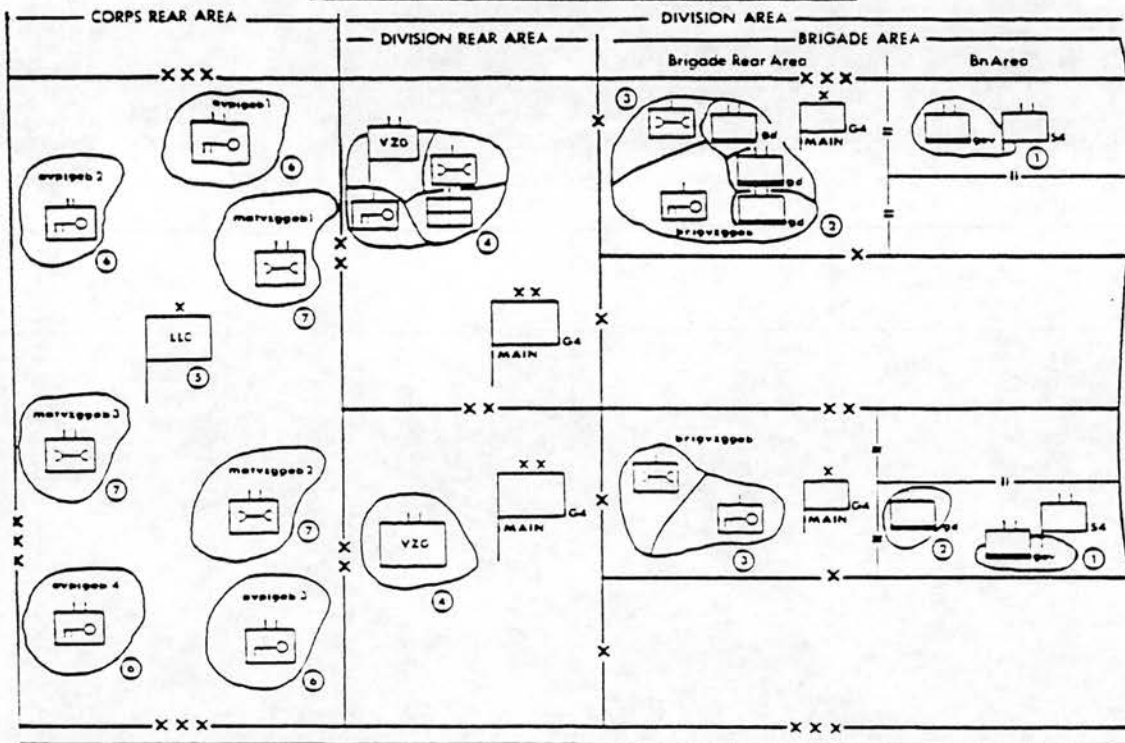
supply organization is outlined below:

FORMATION	TYPE OF SUPPLY UNITS
<u>BRIGADE</u> X	<ul style="list-style-type: none"><li>- Supply Company</li><li>- Maintenance Company</li></ul>
<u>DIVISION</u> XX	None
<u>CORPS</u> XXX	<p>CORPS LOGISTIC COMMAND</p> <ul style="list-style-type: none"><li>- 3 Support Battalions (one for each division)</li><li>- 3 Supply Battalions (one for each division)</li><li>- Maintenance Battalion</li></ul>

The difference between the Corps Logistic Command Support (Legerkorps Vezorgings) and Supply (Aanvullings Plaats) Battalions concerns both structure and deployment area. The Logistic Support Battalion comprises three companies - supply, maintenance and medical, and the battalion is designed to be deployed to the divisional area. The Logistic Supply Battalion which is also established on the scale of one for each division has three companies - supply, ammunition and materiel; and is employed in the Corps area primarily for area support, but as a back-up to the support battalions deployed in the divisional area. A schematic of the supply system of the Netherlands Army Corps is at Figure 3.5.

\* \* \*

# SUPPLY SYSTEM OF A NETHERLANDS ARMY CORPS



## Supplementary Explanations

- ① BATALJONS SEVENSTE TREIN are the battalion combat support elements.  
S - is at the battalion command post.
- ② BATALJONS OORDELEN TREIN are the rest of the battalions support elements.  
They can be located in the REAR BN AREA or in the
- ③ BRIGADE VERBORINGSGEBIED - brigviggeb - (Brigade Logistic Area) is the BRIGADE REAR AREA.  
The battalion support elements of the units in the brigade area request rations (Class I), petroleum, oil and lubricants (Class III) and artillery ammunition and mortar ammunition (Class V) from the Brigade Supply Company. All other ammunition must be picked up at the logistic units of the corps. Repair parts and selected major end items are requested from the Maintenance Company also assigned to the Brigade Logistic Battalion.
- ④ The Division has no own logistic units. Corps troops in DIVISION AREA are supported by the Corps Logistic Command (LLC). The LEEGERKORPS VERBORINGS BATALJON (VZG) is a Corps Logistic Support Battalion with a Supply Company, a Maintenance Company and a Medical Company. Units in the DIVISION REAR AREA request Class I, III and V (arty and mortar ammo usually) supplies from the Supply Company and repair parts and selected major end items from the Maintenance Company.  
S - is at the main division command post.
- ⑤ LEEGERKORPS LOGISTIEK COMMANDO (LLC) is the Corps Logistic Command. The organization of LLC is flexible enough to changing unit and unexpected situations which will occur in war.  
Attached to the LLC are several corps logistic support battalions for the corps units in the division area.
- ⑥ In the CORPS REAR AREA LLC will install several supply areas (AANVULINGS PLAATS GEBOED - avdigeo).  
In each of this areas a supply battalion (AANVULINGS PLAAT BATALJON) is employed and generally the types of stocks held in each area are similar.  
The Brigade Supply Company and the Corps Logistic Support Battalion (VZG-battalion) request all supplies from this supply area. All units from BRIGADE AREA and DIVISION AREA request here their ammunition.
- ⑦ MATERIEEL VERBORINGSGEBIED (matviggeb) is a Maintenance Supply Area. Repair parts and selected major end items are requested from the Maintenance Battalion employed in this area.

Source - NATO's MAS 1989

Figure 3.5

The logistic system of the 1st Belgian Corps is similar to that of the 1st Netherlands Corps in that the division has no organic logistic units; but is supported by troops of the Corps Logistic Support Command. The supply organization comprises:

FORMATION	TYPE OF SUPPLY UNITS
<u>BRIGADE</u> X	<ul style="list-style-type: none"> <li>- Supply and Transportation Company</li> <li>- Maintenance Company</li> <li>- Medical Company</li> </ul>
<u>DIVISION</u> XX	None
<u>CORPS</u> XXX	<p>CORPS LOGISTIC SUPPORT COMMAND</p> <ul style="list-style-type: none"> <li>- 2 Logistic Battalions (scale, one per division) (Forward Logistic Complex)</li> <li>- 2 Logistic Battalions (scale, one per division) (Logistic Support Complex)</li> <li>- 2 Logistic Battalions (scale, one per division) (Logistic Depot Complex)</li> <li>- Medical Companies</li> </ul>

The difference between the three types of logistic battalions provided by the BE Corps Logistic Support Command concerns their support role and planned deployment areas. One type of battalion establishes a Forward Logistic Complex in the rear area of each division; the second type organizes a Logistic Support Complex in the Corps area behind each division; the



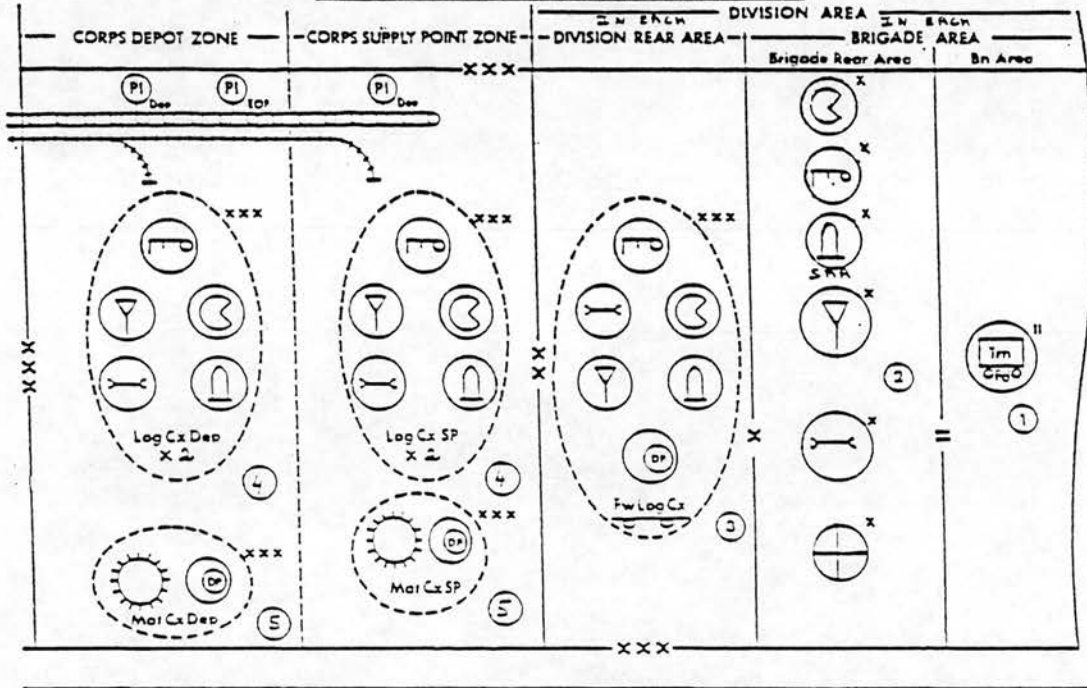
third type provides a Logistic Depot Complex in the Corps rear area. The diagram at Figure 3.6 fully outlines and simplifies the supply system of this Corps.

At this forward edge, the Brigades of the 1st Belgian Corps each have their own organic logistic support units, comprising a combined supply and transportation company, a maintenance company and a medical company. This allocation provides the flexibility needed for dynamic mobile operations by "operational level"<sup>66</sup> units of today.

\* \* \*

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### SUPPLY SYSTEM OF A BELGIAN ARMY CORPS



#### Supplementary explanations

1. Battalion trains are the battalion combat support element. Distinction is made between combat trains and field trains.
2. The logistic support elements of the Brigade (organic to the brigade) are located in the Brigade rear area.  
The brigade supply and transportation company opens brigade distribution points (BDP) classes I, II, III and V (only for small arms ammunition - SAA).  
The brigade maintenance company supplies classes VII and IX, besides maintenance functions.  
The brigade medical company opens a BDP Class VIII.
3. The division has no logistic responsibilities (and no organic logistic units), but Corps logistic troops organize a Forward Logistic Complex (Fw Log Cx) in the rear area of each division. The logistic battalion in charge of a Fw Log Cx performs direct supply (DS) to local divisional units for classes I, II, III, V, VII and IX and for class V to brigade battalions with high consumption (high weight and volume) (e.g. Tn and Artillery battalions).  
The Fw Log Cx is fully mobile.
4. The Corps logistic troops organize two logistic complexes SP (Log Cx SP) and two logistic complexes depot (Log Cx Dep), one behind each division. The logistic battalion in charge of one of those complexes performs
  - a. DS to the local Corps units for classes I, II, III, V, VII and IX;
  - b. GS for classes I, II, III and V.
5. The Corps logistic troops organize one material complex SP (Mat Cx SP) and one material complex depot (Mat Cx Dep) to perform GS for classes VII and IX besides maintenance functions.

Source - NATO's MAS 1989

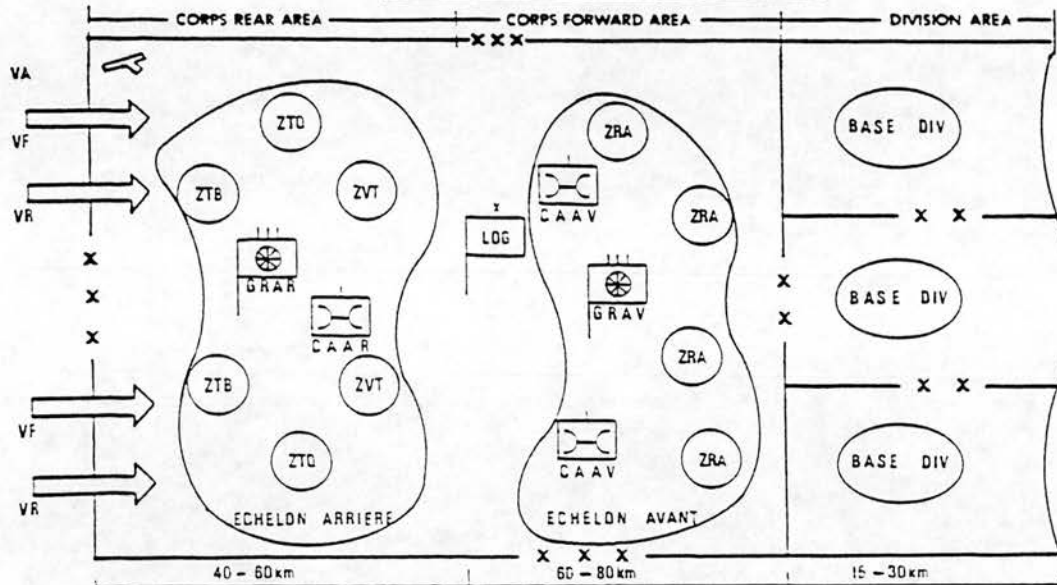
Figure 3.6

Staying in NATO's Central Region, but moving outside the integrated military structure,<sup>67</sup> the system adopted by the French Army is of academic interest if only because, aside from the recently established Franco/German Brigade,<sup>68</sup> French Corps do not have the brigade level of command. In 1977 the French Army removed the operational level of brigades, but established smaller divisions and this grouping still stands. Within a French Army Corps, the supply organization comprises:

FORMATION	TYPE OF SUPPLY UNIT
<u>REGIMENT</u>	- Command and Services Company
<u>DIVISION</u> XX	- Command and Services Regiment
<u>CORPS</u> XXX	LOGISTIC BRIGADE <ul style="list-style-type: none"> <li>- 2 Corps Transport Regiments</li> <li>- 2 Ammunition Companies</li> <li>- 2 Fuel Companies</li> <li>- 2 Supply Companies</li> <li>- 2 Forward Maintenance Supply Companies</li> <li>- Rear Maintenance Supply Company</li> <li>- Medical Supply Company</li> </ul>

The French differentiate within Logistiques three main areas; the replenishment component which embraces transport, ammunition, fuel and supply units; the maintenance function; and the medical component. These are undertaken and coordinated by the Corps

# SUPPLY SYSTEM OF A FRENCH ARMY CORPS



<b>Legend:</b>	VA - by air	CAAR - Rear Supply Company
	VF - by rail	ZTB - Transloading Zone
	VR - by road	ZTC - Technical Zone
	GRAV - Forward Replenishment Group	ZVT - Transit Zone
	GRAR - Rear Replenishment Group	ZRA - Forward Supply Zone
	CAAV - Forward Supply Company	

## Supplementary Explanations

- Logistics of an Army Corps
  - is designed and organized by the Corps rear area CP,
  - is undertaken by the Logistic Brigade.
- The Logistic Brigade covers all fields of logistic and of the medical service.
- Main features
  - the Corps is self-sufficient for 4 combat days;
  - support of forces is undertaken by the Logistic Brigade which obtains its supplies from fixed installations/depots (by rail or road);
  - combat units are freed to a large extent of logistic duties, following the principle that "rear replenishes forward".
- The Logistic Brigade is composed of the following 3 components:
  - the Medical component and the maintenance component which are independently replenished;
  - the replenishment component which provides all other supplies (ammunition, fuel, etc.);
  - in addition, there exist at Army level replenishment capabilities to provide by air supplies for one combat day for a reinforced armored division (by air drop or air transport).

Source - NATO's MAS 1989

Figure 3.7

Logistic Brigade which essentially operates a "push" system.<sup>69</sup> The current French Army Corps supply system is outlined at Figure 3.7; but this organization, together with that of the British, superficially lacks the mobility of the systems adopted by other NATO Corps in the Central Region.

\* \* \*

Turning to another area of French influence, at least linguistically, the Canadians do not have corps or division strength in Europe, but provide to NATO the 4th Canadian Mechanized Brigade Group which is based in Lahr in the Federal Republic of Germany. The brigade is established with a Service Battalion which comprises a supply and transport company and a maintenance company. In addition, a medical support unit is maintained. While this logistic establishment may seem to be designed to fit the needs of a specific brigade in Europe, Canadian organization would provide the following logistic supply units at corps level if deployed:

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FORMATION	TYPE OF SUPPLY UNIT
<u>BRIGADE</u> X	- Service Battalion
<u>DIVISION</u> XX	- Transport Battalion - Supply Battalion
<u>CORPS</u> XXX	- Forward Replenishment Battalion - 2 General Supplies Battalion - Combat Supplies Battalion - Vehicle Supply Battalion - Engineer Support Regiment

The organization at brigade and division level shown above is self-explanatory; but at Corps the Forward Replenishment Battalion and one of the General Supplies Battalion would be deployed in the Corps area, but well forward in what the Canadians term Corps Forward Administrative Area.<sup>70</sup> The remaining Corps logistic units would be positioned further back, but still within the Rear Combat Zone.

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One of the keys to the Canadian logistic support system is the joining of supplies and transport into one responsibility area at the "operational level"<sup>71</sup> of brigade in line with its many NATO Allies. Although there are some differences between the Allies' systems hitherto described they generally all share two common principles; an appreciation of the requirement for logistic support units at brigade level to enhance flexibility and mobility; and the understanding that supply and transportation are essentially part of the 'total logistics' function.

\* \* \*

Turning to the Soviet Armed Forces the following comment by Colonel General Ivan Golushko, the current Chief of Staff of the Rear Services<sup>72</sup> serves to remind that whatever the nationality or political conviction, the military aim of achieving efficient logistic support to the troops on the battlefield remains the same:

Continuous supplies of fuel, ammunition, food, weapons and equipment repair, and attending to the wounded is strenuous labour, without which success in any aspect of modern war would be unthinkable.<sup>73</sup>

The above quote could be taken to imply that the Soviet Forces operate a similar logistic system to those of

the NATO Allies; but a fundamental difference concerns the emphasis placed upon 'continuous supplies'. While NATO systems do rely upon continuous replenishment at every level on the battlefield, an umbilical cord running from the rear forwards, the Russians employ a quite different methodology. This entails providing the tactical formations (division level) with sufficient logistical resources to complete their missions over a set time and attrition period without resupply. The divisions fight by living off their logistic assets until they are replaced in the line by a fresh division, which is also provided a set scale of resources. The relieved division is then replenished or reconstituted by Army level resources, and it is at this level where the Russian commitment to 'continuous supplies' takes place. This methodology ensures that tactical formations are not limited by logistic constraints in offensive operations and in this respect, the significance of offensive operations is stressed.

The Soviet States' principles of warfare places emphasis on the primacy of the offensive as a means of waging war,<sup>74</sup> and while the declared shift to a doctrine of 'reasonable or defensive sufficiency',<sup>75</sup> may affect the structure, size and organization of Soviet Forces,<sup>76</sup> the ability to carry out offensive operations through its tactical doctrine and training is fully maintained. Even the defensive NATO

Alliance aims to have an ability to conduct offensive counterstroke operations.<sup>77</sup>

The Soviet logistic system therefore is given a high priority and is designed to support vast mobile forces on the battlefield. If given a high level of combat readiness, the Soviet Forces marshalled for 'all-out' conventional operations in the European theatre could comprise:

Almost 14,000 armoured vehicles and artillery pieces, augmented by a further 7,100 tanks and guns within 16 hours, followed by a further reinforcement within 24 hours, bringing a grand total just short of 20,000 tanks and guns.<sup>78</sup>

The logistic support of such sizeable forces, in the words of General Golusko, "characterized by resolute and dynamic actions and by abrupt changes in the situation",<sup>79</sup> would place significant demand on the supply system. The movement of manpower and supplies to the front lines is the responsibility of what is named the Rear Services.

The Soviet Forces concept of the 'Tyl' or Rear is<sup>80</sup> an important one embracing all service support within one organization:

Rear services are divided into central (strategic) operational, and troop (tact-

ical) units. A measure of the constantly increasing importance of the Tyl Corps is that its national chief was recently given the rank of marshal. At the national level and down through each subordinate level of military command, there are separate headquarters and staffs for the Chiefs of the Rear, as those responsible for supply are known.<sup>81</sup>

In other words a dedicated logistic branch controls all resources starting at national level under its Marshal all the way forward to the battlefield where an 'operational rear' is established. This operational rear extends from the forward battle position to between 100 and 150 km back. Supplies are controlled by the army 'Tyl' chiefs, who will normally operate base and forward depots. These army level depots<sup>82</sup> are the usual break bulk points for rail-shipped supplies and terminals for fuel pipelines.

The last three years has seen a major reorganization of the Soviet logistic support structure due to four main reasons. First, the influence of experience in Afghanistan. Second, the perceived demands for greater battlefield mobility. Third, the increasing emphasis placed upon conventional warfare and finally, the now recognized demands to coordinate rear area security. The American analyst, Graham H Turbiville, Jr., who specializes in Soviet logistic concepts, has noted, from a comprehensive



and continuing research of Russian publications, "a sweeping reorganization of the materiel support system in all motorized rifle, tank and airborne divisions in the Soviet Armed Forces".<sup>83</sup> It has been reported that this reorganization will affect the logistic support system for some 200 divisions,<sup>84</sup> which essentially combines the elements of supply, transport and maintenance into 'materiel support' units at various levels under a single commander. This new structure replaces the earlier "fragmented transport/supply entities"<sup>85</sup> when Russian divisions were established with a number of disparate logistic units, of which transport provided the major focus.<sup>86</sup>

The new system of Soviet ground forces logistic organization provides the following types of materiel support (materiel' nogo obespecheniia) units:

FORMATION	TYPE OF SUPPLY UNIT
REGIMENT	- Materiel Support Company
DIVISION	MATERIEL SUPPORT BATTALION: - 2 Transport Companies - Fuel Transport Company - General Purpose Cargo Transport Company - Combined Depot (Supplies) - Mobile Field Bakery - Medical Section - Maintenance Platoon - Supply and Service Platoon - Engineer Platoon
ARMY	- Materiel Support Brigade

(Source: Graham H. Turbiville, Jr)

This new organization of materiel support units has been described as the most important change to occur within "Soviet tactical-level logistics in recent years".<sup>87</sup> It is geared to support the demands of modern and mobile fire and manoeuvre formations on the battlefield; an aim it has in common with the NATO Allies. It has also been recognized that the new organization of providing integrated materiel support units at regiment, division and corps level could easily be adjusted to any future structure changes within the Soviet Army.<sup>88</sup>

Soviet Army formations have additional logistic resources, which includes separate medical units at a regiment, division and army level. They are all part of the 'Tyl' designed to support the fighting elements and remain self-contained. As already mentioned, it is emphasised that the Russian supply system at divisional level, unlike those of the NATO Allies, does not rely upon permanently maintained lines of supply when on the march. At Army level where 'continuous supply'<sup>89</sup> really does apply, it is estimated that its forces could fight for 12 to 14 days if necessary, even without re-supply.<sup>90</sup> According to a 1984 US Army manual "Soviet Military Forces do receive effective logistic support",<sup>91</sup> and given the sheer volume of materiel required, the Soviet Army has a most creditable integrated

logistic supply system.

\* \* \*

Before summarizing the essentials of this Chapter it is necessary, if only to convince the non-British reader of the academic critical level of this paper, to make special comment on the British battlefield logistic support position. It is clear there are two systems operating within Allied Forces Central Europe deployed as part of NATO's integrated command structure.<sup>92</sup> The UK concept where logistics are centralized at division with elements allocated to brigades as required, and those of the immediate Allies who have established logistic units organic to their brigades. The latter has the advantage of giving these fighting formations greater flexibility on the battlefield and makes the logistics commander responsible to the formation commander for command and control of logistic personnel, their training, the implementation of the logistic plan (determined by the brigade staff), and the siting and defence of the rear areas. The British system places this significant responsibility on the shoulders of the brigade deputy Chief of Staff which is quite a tall order for an officer who will probably have received minimal logistics training. There is little doubt that of the two systems, the provision of integrated brigade logistic support units has the greatest merit in meeting the demands of today's

dynamic mechanised warfare.<sup>93</sup>

The British reluctance to adopt a battlefield logistics system similar to its Central Region Allies comprises a mix of variables which may be due to pragmatism and a perception of what is realistically achievable; but is additionally influenced by background and a form of military philosophy. The pragmatic approach acknowledges that several adjustments to the Army's 'teeth-to-tail ratio',<sup>94</sup> have occurred over time when logistic personnel levels were cut; against today's background of ever declining defence budgets<sup>95</sup> which provides little scope to fund a change. In any event, financial priority is usually given to upgrading tanks, guns and other more visible elements of deterrence.<sup>96</sup> The considerations of background or philosophy is essentially linked to reluctance to change which is particularly appropriate to the Armed Forces. The term 'all professional Army' is seen as an accolade; however, the employment of professionals, especially in non-profit organizations, is not necessarily synonymous with task efficiency. It has been stated that "Professionals often have motivations that are inconsistent with good resource utilization, and their success as perceived by their professional colleagues reflects these motivations".<sup>97</sup> People resist change if it rearranges lines and levels of authority and, as outlined by Professor Child of Aston University

## Management Centre:

A change aimed at simplifying an organization structure, may be through reducing the number of hierarchical levels, will probably be seen by some as a threat to job security and their prospects of promotion further up the hierarchy. A change aimed at enriching jobs of subordinates may be viewed by a manager as a threat to his authority... The very process of change may be seen as an unwelcome disturbance and interference to a well established routine.<sup>98</sup>

Yet if the Army adopted a strategy of providing integrated logistic support units for the battlefield at brigade level, it follows that this step could create the rationale for a structure change further back.<sup>99</sup> Should this approach be taken to its logical conclusion, it could well result in the formation of a single logistic corps embracing the functions of supply, transport and maintenance with the possible inclusion of medical support. It is this spectre, of demolishing current hierarchical groupings and cutting cap badge interests, which should not be underestimated in stiffening internal military resistance to change.

There is an awareness of UK sustainability difficulties on the battlefield resulting from three main areas. Firstly, two studies completed in 1981 involved an examination into the probable ammunition and equip-



ment expenditure, at maximum intensity, within BAOR in the 1980-1990 time-frame taking into account estimated attrition losses.<sup>100</sup> The results identified "very large increases in artillery daily ammunition expenditure rates. In the case of M109 for example, the rates were trebled."<sup>101</sup> Secondly, these increases were noted at the time when the British field artillery main calibre is in the process of change from 105 mm to 155 mm. The latter shell is approximately two and a half times heavier than the 105 mm. Thirdly, the scheduled phased introduced beginning now (1989), of the new multi-launch rocket system.<sup>102</sup> All these elements have created a serious shortfall in battlefield transport lift which serves to underpin the cry "when resources are scarce, logistics are commanded and controlled at the highest practical level".<sup>103</sup>

However, the realities of general war in Europe would make the flexibility of centralized logistic control difficult to achieve. Communications would be vulnerable to intercept and jamming which the Soviet Army has well developed expertise. In the final analysis, all radio communications could be blocked by Electro Magnetic Pulse.<sup>104</sup> A total block-out would seriously impact upon British combat logistic support, but would only marginally effect its immediate Allies or a Soviet aggressor. BAOR exercises have, in the recent past, endeavoured to

simulate operations conducted on 'radio silence'; however, without the use of the civil telephone (Bundespost), logistic support systems coordinated at divisional level would have been seriously degraded.<sup>105</sup>

UK logistic planners see the saviour of the battlefield shortfall in transport lift to be the introduction of the Demountable Rack Offloading and Pickup System (DROPS). This equipment is considered the only viable way of coping with the increased tonnages on the battlefield "without unacceptable increases in manpower and conventional vehicles".<sup>106</sup> The system consists of a prime mover (truck) and a "demountable" rack or platform known as a flatrack. A flatrack is designed to carry 10 standard pallets or military unit load containers each weighing 1.5 tonnes; the total lift 15 tonnes. A loaded flatrack can be drawn onto a prime mover in less than 5 minutes as a one man operation. Offloading is equally simple. The systems advantages are: high prime mover utilisation to achieve the increased lift, it is road/rail compatible with the planned introduction of specialist rail transfer equipment, and crossloading is almost eliminated. The aim is to move a loaded flatrack of ammunition (or mines) from the depot to the gun lines without unloading the flatrack. Its key role and justification for the expenditure is the movement of ammunition; however, DROPS is dependent upon

effective command and control and, in the words of the manufacturer: "Efficient communications and ADP assistance will be essential if the system is to achieve its full potential".<sup>107</sup>

The adoption of integrated logistic support units at brigade level by all in-theatre Allies, leaves one to question if the division is really the practical level to control battlefield logistics supply of the fighting formations. Indeed, the concept of establishing logistic support battalions or regiments is not new to the British; but such units are only provided for specific functions for what is termed 'Out of Area Operations'.<sup>108</sup> The Royal Marines 3 Commando Brigade is supported by a logistic regiment which comprises a headquarters, transport, ordnance, medical and workshops squadron, together with a number of specialists.<sup>109</sup> In addition, 5 Airborne Brigade has a logistic battalion which was formed in April 1985. This establishment was due in part, to the criticisms of the Falklands campaign where 5 Brigade, working alongside 3 Commando Brigade, had to function under the system of a mixture of attached logistic units. The comparison emphasised effectiveness of the commandos integrated logistic regiment which fortunately was the first to arrive in theatre and was able to take charge of all land force logistics. A subsequent analysis of logistics in the Falklands noted that

"the campaign highlighted the inestimable value of formations having their own dedicated logistic units in peace and war",<sup>110</sup> and recommended the introduction of brigade support units in BAOR. But yet, in spite of its advantages, the British Army policy remains that such groupings are only necessary for Out of Area Operations and are not applicable to the 1st British Corps.<sup>111</sup>

\* \* \*

This Chapter has recorded a number of different national logistic systems designed for use on the battlefield. If one wished to develop a good logistic system to support offensive operations, then the Russian methodology should be considered as conceptually it is basically sound. NATO Forces in the Central Region however, have to cope with a conventional defence and react to an enemies offensive initiative. In this respect, the Warsaw Pact Forces are capable of creating spearheads<sup>112</sup> which dictate that a NATO defender operates a mobile area defence.<sup>113</sup> Mobility in defence requires correspondingly flexible logistic support and the essentials of a system to adequately sustain such operations are: First, sufficient mobile logistic supplies organic to each practical command level to sustain the force for the period of its normal mission.<sup>114</sup> Second, mobility of

supplies and services at the supporting level. Third, command and control of logistics at the level of tactical/operational responsibility. Fourth, the ability placed at the level of the appropriate operational command to determine policy, planning or execution of logistic support.

It is recorded in the first draft of a document on Land Forces Logistic Doctrine: "the NATO system should be characterized by mobility, initiative, responsiveness and flexibility".<sup>115</sup> Although all NATO forces in the Central Region have their deficiencies in stocks and transport, they all endeavour to make the best use of their resources when designing their logistic systems to meet the above criteria. The ground forces of Belgium, Germany and the Netherlands all take into account the four essentials noted in the above paragraph. The United States forces are structured towards a similar system following extensive trials. The United Kingdom's logistic system is trying to cope with the problems, but some of its policies have to be changed. An appropriate message to close this Chapter are comments from the business world by two distinguished Professors of Management:

...the right organization structure is not performance itself, but rather a



prerequisite of performance. The wrong structure is indeed a guarantee of non-performance.

Peter Drucker<sup>116</sup>

and

Change is not to be advocated for its own sake. But the organization that can adapt to changing situations and requirements is the organization that survives. The assumption that a given organizational form which works today will still be right in five years' time is too often a misplaced assumption.

Charles Handy<sup>117</sup>

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### NOTES - CHAPTER 3

1. See Lieutenant General Eberhard Eimler, "The Role of Air Power in Defence of the Central Region", NATO's Sixteen Nations, (February/March 1987), p.57.
2. See General Dr Ferdinand von Senger und Etterlin, "Defence of Central Europe: The Challenges of the 1980's", NATO's Fifteen Nations, (Special Issue 2/1981), p.16.
3. See General John R. Galvin, "Trans-Atlantic Partnership for Security: Canada in NATO", Canadian Defence Quarterly (Summer 1988), p.13.
4. Forward Defence Strategy - see UK Statement on the Defence Estimates 1988 (London, 1988), Volume 1, p.15.
5. See General Ulrich de Maiziere, "Rational Deployment of Forces on the Central Front", Western European Union Document 663 (2 April 1975), p.10.
6. UK Statement on the Defence Estimates 1986 (London, 1986), Volume 1, p.33.
7. Colonel C.G. Shaw, Supply in Modern War (London, 1938), p.228.
8. See NATO Facts and Figures (Brussels, 1984), p.187; also Chapter 1 note 71.
9. Colonel C.G. Shaw, Supply in Modern War (London, 1938), p.218.
10. Ibid, p.28.
11. Defined as:

The rear part of the theatre of operations (behind but contiguous to the combat zone) which contains the Lines of Communications (LOC), establishments for supply and the evacuation and other agencies required for the immediate support and maintenance of the field forces.

(NATO Glossary of Terms and Definitions AAP-6).

12. Defined as:

That area required by combat forces for the conduct of operations and that territory forward of the Army Group rear boundary. This zone is divided into the FCZ and RCZ.

(NATO Glossary of Terms and Definitions AAP-6).

13. Defined as:

Usually that portion of the CZ comprising the territory between the corps rear boundary and the army group rear boundary.

(NATO Land Forces Logistic Doctrine ALP-9 (First Draft: September 1989), Annex A, p.A-2).

14. Defined as:

That portion of the CZ forward of the corps rear boundaries.

(NATO Land Forces Logistic Doctrine ALP-9 (First Draft: September 1989), Appendix A, p.A-1).

15. See NATO Land Forces Logistic Doctrine ALP-9 (First Draft: September 1989), p.7.

16. Major General E.M. Graham, Jr., "The Dynamism of Army Combat Logistics", Military Review (April 1976), p.65.

17. The nations are: Belgium, Germany, the Netherlands, United Kingdom and United States.

18. NATO document MC 36/2 (Revised) of 18 May 1960 and Council Resolution of 23 February 1952.

19. It has recently been recorded that:

...significant differences, particularly in organizations and equipment, exist among the NATO land forces.

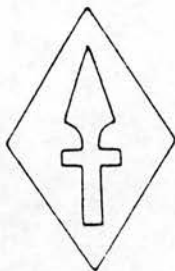
(NATO Land Forces Logistic Doctrine ALP-9 (First Draft: September 1989), p.7).

20. See R.A. Beaumont, "Beyond Teeth and Tail: The Need for New Logistical Analogies", Military Review (March 1985), pp.3-11.

21. See Chapter 1 note 53. A similar 'shop window mentality' is recognized by Brigadier F.A.L. Alstead in his study The Reinforcement of Central Europe in Crisis and War (NATO Brussels, 1989), p.246.
22. Operational Readiness Tests of army units are carried out under NATO staff direction; but it is usual for the staff officers conducting the tests to belong to the same nation of the units being tested.
23. The Supreme Allied Commander Europe has referred to: "my mission of deterrence" and noted that "the main thing that we should be concerned with is preventing war, not fighting war".  
  
(General John R. Galvin's Address to the Royal United Services Institute, London, on 10 February 1988 - author's notes).
24. There are five nations fielding Corps level formations - Belgium, Germany, The Netherlands, United Kingdom and United States; with Canada providing a Brigade Group.
25. The author makes no apologies for this nautical reference based upon his earlier sail - training experience as 'Worcester' cadet.
26. NATO Glossary of Terms and Definitions AAP-6.
27. For two pragmatic comments concerning 'limited resources' in NATO's Central Region see General Sir Martin Farndale, "Follow-on Forces Attack", NATO's Sixteen Nations (April/May 1988), p.45 and Brigadier F.A.L. Alstead, The Reinforcement of Central Europe in Crisis and War (NATO Brussels, 1989), p.254.
28. Exemplified by UK's Assistant Chief of the Defence Staff (Logistics): "...after 40 years of the Alliance, progress on interoperability has been minimal". (From a paper by Major General I.S. Baxter, "Sustainability - a concept which may come of age", presented to the King's College, London/ MOD Conference "Britain and the Central Region - 18/19 July 1989").
29. For example; the Federal German Ministry of Defence has 176,000 civiliansearmarked for wartime support tasks; see Neil Munro, "The West German Territorial Army", Armed Forces (April 1987), p.167.

30. R.A. Beaumont, "Beyond Teeth and Tail: The Need for New Logistical Analogies", Military Review (March 1985), p.11.

31. The Emblem of the 1st British Corps:



32. The NATO definition of a brigade is:

A basic 'fighting' formation combining combat, certain combat support and some other operational support capabilities required for sustained combat, larger than a battalion and smaller than a division.

(NATO Glossary of Terms and Definitions AAP-6).

33. NATO defines a division as:

A major administrative and tactical unit/formation which combines in itself the necessary arms and services required for sustained combat, larger than a regiment/brigade and smaller than a corps.

(NATO Glossary of Terms and Definitions AAP-6).

34. See Brigadier G.B. Fawcus, Chief of Staff 1st British Corps in a letter published in British Army Review (August 1985), p.78.

35. Simon O'Dwyer - Russell, "NORTHAG concept 'aims to win'", Jane's Defence Weekly (26 July 1986), p.116.

36. NATO Glossary of Terms and Defintitions AAP-6.

37. See Brigadier G.B. Fawcus, Chief of Staff 1st British Corps in a letter published in British Army Review (August 1985), p.78.

38. The number of transport squadrons within each



divisional transport regiment is, alas, sometimes reduced to just two.

39. The Royal Corps of Transport (RCT) and the Royal Army Ordnance Corps (RAOC).
40. Colonel C.G. Shaw, Supply in Modern War (London, 1938), pp.204-205.
41. Ibid, p.204.
42. Ibid, p.218.
43. One of the few NATO organizations with its headquarters remaining located in France. The Central Europe Operating Agency is in Versailles.
44. Because some CEPS depots are established within a national Army Corps area, there is a tendency for its troops to regard the facility as their own. This is not so as the depot is NATO owned and funded and other nations could draw upon its supplies.
45. D.C. Isby, "Battlefield Equipment Recovery and Repair", NATO's Sixteen Nations (Special Issue 1/1985), p.108.
46. Ibid, pp.103-113.
47. Brigadier G.B. Fawcus, Chief of Staff 1st British Corps in a letter published in British Army Review (August 1985), p.78.
48. RAMC Training Pamphlet 1986, Chapter 2, Annex C.
49. Ibid.
50. UK Army Field Manual, The Armoured Division in Battle, Volume 1, Part 2 (Code 71344), p.12-6.
51. See James Meacham, "NATO's Central Front", The Economist (30 August 1986), Survey, p.15.
52. For US Power-Projection, see Frank C. Carlucci Annual Report to Congress Fiscal Year 1990 on the FY 1990/FY 1991 Biennial Budget and FY 1990-1994 Defense Programs (Washington, D.C., 1989), p.28.
53. Four outstanding examples are; Duncan Ballantine, Hawthorne Daniel, Henry Eccles and James Huston.
54. Often abridged to FASCO.

55. M. Mooradin, "DISCOM in a 'Come as you are' War", Military Review (June 1976), p.41.
56. US Field Manual 63-20 outlines the role of the Forward Support Battalion and US Field Manual 63-21 describes the role of the Main Support Battalion. Both documents published by Headquarters Department of the Army Washington, D.C., 18 February 1986.
57. Ibid.
58. Klaus Wittmann, "NATO's Front Line", Defence (April 1988), p.256.
59. Ibid, p.259.
60. The divisions currently comprise - 6 armoured, 4 mechanised infantry, 1 mountain and 1 airborne.
61. Host Nation Support (HNS) is defined in NATO Glossary of Terms and Definitions AAP-6.
62. See Niel Munro, "The West German Territorial Army", Armed Forces (April 1987), p.170.
63. An area within the Federal Republic of Germany between the various Corps rear boundaries and the borders of the Netherlands, Belgium, Luxembourg and France.
64. Lieutenant General Eberhard Burandt, "Indispensable Partner", NATO's Fifteen Nations (Special 2/1981), p.54.
65. Organic to the formation.
66. Major General I.S. Baxter in his presentation to the King's College London/MOD Conference - 18/19 July 1989 emphasized that "...the operational level is that of the brigade".
67. Within NATO's command region of Central Europe only France is outside the integrated military structure.
68. See David Fairhall, "The military steps to a political initiative", The Guardian (8/April 1988), p.23.
69. For logistics 'push' and 'pull' see E. de Fabribeckers, "The Long Tail: Supply and Transport in the Modern Army", NATO's Sixteen Nations (Special 1/1983), p.100.

70. The Canadians name their FCZ to the rear of their divisional boundary the Corps Administrative Area. This in turn is sub-divided into a Corps Rear Administrative Area and a Corps Forward Administrative Area.
71. Major General I.S. Baxter, see note 66 above.
72. This appointment is essentially Second-in-Command of the Rear Services of the Soviet Armed Forces.
73. Colonel General I. Golushko, "Logistics Support in Battle", Sovetskoye voyennoye obozreniye (No. 5, 1984), p.18.
74. V.G. Reznichenko et al., Taktika (Moscow Military Publishing House, 1984).
75. See V. Bogdanov and G. Lokshin, "Reasonable Means Sufficient", X X Vek i Mir (No. 12, December 1987), pp.2-9; also Manki Ponomarev, "Criteria of Sufficiency: Two Approaches", Krasnaya zvezda (26 February 1988), p.3.
76. See Graham H. Turbiville, Jr., "Rear Service Support Concepts and Structures", Military Review (December 1988), pp.78-79 and footnote No. 14.
77. See Lieutenant General Sir Martin Farndale, "Follow-on Forces Attack", NATO's Sixteen Nations (April/May 1988), pp.42-48 and 50.
78. Professor J. Erickson, "The Soviet 'Conventional Option': Constraints in Time and Space", University of Edinburgh Defence Studies Precis, 1984, p.11.
79. Colonel General I. Golushko, "Logistic Support in Battle", Sovetskoye voyennoye obozreniye (No. 5, 1984), p.18.
80. Tyl meaning 'rear' has been described as embodying two very wide-embracing concepts:

Firstly, it denotes the homeland with all its industrial production capacity, its human and material resources from which the State draws its military strength. Secondly, it refers to the entire rear services organization of the Armed Forces and its various branches, including logistics and supply, technical maintenance,

medical support, maintenance of  
Loc etc..

(C.N. Donnelly, "Rear Support for the Soviet Ground Forces", International Defense Review (April 1979), p.344). See also: C.N Donnelly and M.J. Orr, "Soviet Logistics Flexibility", International Defense Review (7/1986), p.949.

81. Mark L. Urban, Soviet Land Forces (London, 1985), p.62.
82. It is emphasized that the depots, even when located forward, are army level assets and remain firmly under army level control.
83. Graham H. Turbiville, Jr., "Soviet Logistics Support Concepts Change", Army Logistician (March - April 1987), p.2.
84. Ibid.
85. Graham H. Turbiville, Jr., "Rear Service Support Concepts and Structures", Military Review (December 1988), p.74.
86. See C.N. Donnelly, "Rear Support for the Soviet Ground Forces", International Defense Review (April 1987), pp.344-350; also Oberstleutnant Gunter Lippert, "Die Logistik der sowjetischen Landstreitkrafte", Soldat und Technik (5 May 1981), translated and disseminated in US Intelligence Information Report 2 218 6640 81 dated 20 November 1981.
87. Graham H. Turbiville, Jr., "Soviet Logistics Support Concepts Change", Army Logistician (March - April 1987), p.7.
88. See Graham H. Turbiville, Jr., "Rear Service Support Concepts and Structures", Military Review (December 1988), p.78.
89. Colonel General I. Golushko, "Logistics Support in Battle", Sovetskoye voyennoye obozreniye (No. 5, 1984), p.18.
90. Graham H. Turbiville, Jr., "Sustaining Theater Strategic Operations" The Journal of Soviet Military Studies (April 1988), p.99.
91. Graham N. Thompson and James Kinnear, "The Bear's Tail", Armed Forces (August 1988), p.368.
92. This criteria excludes France.

93. See Brigadier Richard E. Simpkin, Mechanised Infantry (Oxford, 1980).
94. The following comment by a Professor of History of Texas A & M University who is also co-author of Defence Analysis is relevant:
- When someone expresses the view that the 'tail-to-teeth' ratio is too lopsided, there is no firm basis on which to say what the optimum ratio should be.
- (Professor R.A. Beaumont, "Beyond Teeth and Tail: The Need for New Logistical Analogies", Military Review (March 1985), p.10).
95. See Robert Fox, "Spending to fall next year in real terms", The Daily Telegraph (16 November 1989), p.12; see also NATO's Defence Planning Committee Progress Report on Shared Roles, Risks and Responsibilities in the Alliance (Brussels, November 1989), p.6.
96. See Major General Ken Perkins, Weapons and Warfare (London, 1987), p.270.
97. R.N. Anthony and R.E. Herzlinger, Management Control in Non Profit Organizations (Homewood, Illinois, 1985), p.46.
98. Professor J. Child, Organization - A Guide to Problems and Practice (London, 1970), p.196.
99. Most objective assessments would advocate a structure change within the logistic corps. The current Army structure which provides "nineteen separate, totally autonomous support corps" was criticised by the UK Government's independent financial watchdog, see Adela Gooch, "Army regimental system attacked by Audit Office" The Daily Telegraph (10 May 1989), p.2; and the report by the National Audit Office, Ministry of Defence: Control and Use of Manpower, Ordered by the House of Commons to be printed 27 April 1989.
100. See M.A. Gilbertson, "Development of Logistics in the British Army" in J.J.G. MacKenzie and B.H. Reid, eds., The British Army and the Operational level of war (London, 1989), p.78.
101. K.A.P. Stevenson, "Praise the Lord and pass the ammunition", Royal Artillery Journal (September 1984), p.95. The M109 gun fires a 155 mm shell.



102. For a comprehensive background see J.R. Robinson, "MLRS: a new dimension in artillery fire support", in G. Blakey, ed. Defence Systems International (London, 1989), pp.143, 144, 146 and 149.
103. Brigadier G.B. Fawcus, Chief of Staff 1st British Corps in a letter published in British Army Review (August 1985), p.78.
104. See Susan B. Chodakewitz, Michael J. Deane and Stephen G. Weatherly, "Soviet Strategic C3: The Threat and Counterthreat", Signal (December 1985), pp.33-36.
105. 1st British Corps logistic training is suffering further erosion. This comment by the Commander Transport concerning Ex Iron Hammer which took place in Autumn 1988 is relevant:

In order to ensure that combat units gained the maximum value from the training, logistic play was sacrificed with not a single pallet of ammunition unloaded at gun lines, nor any simulated loads issued through brigade distribution points.

(Digest of a presentation by Brigadier J.D. MacDonald et. al. in "Training-The Changing Perspective in BAOR", Royal Corps of Transport Review (June 1989), p.21.)
106. Multilift Limited, "DROPS-the logistic system of the future", in G. Blakey ed., Defence Systems International (London, 1989), p.335.
107. Ibid, p.338.
108. Brigadier G.B. Fawcus, Chief of Staff 1st British Corps in a letter published in British Army Review (August 1985), p.78.
109. Over three-quarters of the personnel are provided by the Royal Marines, the remainder are from the RCT, RAOC, REME, RAMC and others.
110. I.M. Vaughan-Arbuckle, "Logistics in the Falklands", British Army Review (April 1985), p.49.
111. This was most strongly emphasised by Brigadier G.B. Fawcus in his official letter to the British Army Review (August 1985), p.78.
112. It has been suggested that as much as 8:1 superiority could be achieved at a main point of

effort, see General Sir Martin Farndale, "The Use of Helicopters on the European Battlefield", Vertiflite (May/June 1989), p.16.

113. NORTHAG's 'new' concept of operations places emphasis upon "tactical flexibility and mobility", see UK Statement on the Defence Estimates 1986 (London, 1986), Volume 1, p.33.
114. A unit's basic load of bulk supplies normally amounts to "a maximum" of 5 Days of Supply (DOS) with an additional 9 DOS "stopped by corps in corps depots"; see E. de Fabribeckers, "The Long Tail: Supply and Transport in the Modern Army", NATO's Sixteen Nations (Special 1/1983), p.101.
115. NATO Land Forces Logistic Doctrine ALP-9 (First Draft: September 1989), p.2-2.
116. P.F. Drucker, "New Templates for today's organization", Harvard Business Review (January/February 1974), p.13.
117. Charles B. Handy, Understanding Organizations (London, 1976), p.366.

#### CHAPTER 4 - LOGISTIC STOCKS AND BURDEN-SHARING

The NATO definition of sustainability is: "the ability of a force to maintain the necessary level of combat power for the duration required to meet its objectives".<sup>1</sup> The true objective of NATO's Allied Command Europe (ACE) is to defend allied territory by conventional force for as long as possible before having to invoke the second leg of NATO's triad of deterrence - the use of nuclear weapons. The sustainability of conventional force is therefore a means of raising the nuclear threshold through the maintenance of fighting power.<sup>2</sup> Because the NATO definition of sustainability is broad, emphasis is placed upon many elements depending upon the perspective of the beholder; but essentially sustainability is about holding a sufficiency of war stocks and being able to get them to the fighting troops at the right time. Even trained personnel who have high morale, sound equipment and well organized systems are of little value in a war situation without an adequate supply of fuel and ammunition, which one outstanding field commander noted as being "the first essential condition for an army to stand the strain of battle".<sup>3</sup>

Time and again excellent pieces of academic work compare force numbers, analyse training standards, assess psychological motivation and run computer models of Central Region threat perceptions.<sup>4</sup> There are intellectual races to compare NATO and Warsaw pact weapons, equipment and killing potential; but nearly all these studies ignore the vital importance of war stocks. A degree of recognition is occasionally paid to the NATO sustainability dimension;<sup>5</sup> but it tends to be a soft focus view with sharpness centred upon equipment and numbers, hiding the hard fact that logistic stock levels are simply inadequate. General Rogers as SACEUR repeatedly went as far as possible, without undermining the deterrence value of NATO forces, in stressing the importance of logistic stocks:

Because of our lack of sustainability... primarily ammunition, materials to replace losses on the battlefield, tanks, howitzers, trained manpower... I have to request the release of nuclear weapons fairly quickly after a conventional attack. And I'm talking about in terms of days, not in terms of weeks or months.<sup>6</sup>

Given the General's concern, it is of interest to consider why Allied nations permit this unacceptable situation to exist. A scan of NATO's Defence Planning communiques<sup>7</sup> shows that the words "Ministers Affirm" are inevitably used in respect of sustainability.

Bold words are however, no substitute for promised action as the non-performance of Allied nations in meeting their agreed goal of 3% annual increase in defence expenditure has shown.<sup>8</sup> The reason for Allied reluctance is not a total lack of will, as indeed Ministers regularly reaffirm their commitment to NATO's agreed stock level targets. It is simply that even normal 'non-smart' conventional ammunition is very expensive. 'Smart' is the term applied to precision guided munitions (PGM's) or terminally guided submunitions (TGSM's) and one type of 'smart' 155 mm artillery shell named Copperhead homes onto a target illuminated by a laser designator.<sup>9</sup> Taking a hypothetical example of 150 rounds of the normal 'non-smart' rounds for a 155 mm gun, which would be moderate consumption for one day, the expenditure would be about £174,000.<sup>10</sup>

If the above figure was multiplied by the number of 155 mm guns in a nation's inventory and the staggering result would represent only one day's expenditure at a firing rate some experts would consider to be low.<sup>11</sup> Because stockpile costs are easily identifiable, it provides governments with a commodity which can be used to save funds at short notice. Expenditure can be reactivated at the end of a financial year if there is an underspend; but for many Allied nations with budgetary problems, ammunition



has often fallen the wrong side of the accountant's margin. The present situation has not suddenly occurred, but has steadily developed over time.<sup>12</sup>

When the North Atlantic Treaty was signed on 4 April 1949,<sup>13</sup> the Allied nations forces in existence at the time were mostly equipped with US or UK equipment as a result of the Second World War. Similarly, there were significant quantities of war-time ammunition stocks still available to meet immediate requirements.<sup>14</sup> Paradoxically this situation provided a high degree of standardization and flexibility, although these benefits were not readily appreciated at a time when NATO planners priorities centred upon the military structure and the feasibility of integrated forces.<sup>15</sup>

Because NATO was founded as an international and not supranational organization, no centralized logistic support system was introduced.<sup>16</sup> It left the maintaining and equipping of national contingents to the individual countries involved, assuming that 'logistics is a national responsibility'.<sup>17</sup> This principle in time led to an erosion of the immediate post-war standardization advantages as nations modernized equipment and upgraded war stocks by purchasing from a variety of arms manufacturers. Logistics was not however, fully excluded from NATO decision making

as the North Atlantic Council resolution of 23 February 1952 noted:

The responsibility for logistic support to national component forces will, in general, remain with the responsible authorities of the nations concerned. The responsibility for coordination will, however, rest with the Supreme Commander, and with his major subordinate commanders at the appropriate levels.<sup>18</sup>

The key word 'coordination'<sup>19</sup> however, can be interpreted differently depending whether the level of command is responsible for execution, planning or policy. Its effect upon NATO logistics policy is that requirements are recommended by NATO commanders, agreed by nations, coordinated by NATO commanders and then hopefully implemented by the nations.<sup>20</sup>

One of the most important roles of logistic coordination in NATO concerns the issue of stockpile planning guidance. The aim is to ask nations to hold sufficient war stocks to meet operational requirements, and this was originally based upon the logistic experience of the Second World War and planning for war. At first the assessment was that there should be sufficient war stocks available to meet the operational plan until war time manufacturing capabilities could be reactivated. The planning assump-

tion at that time was that 90 days (3 months) operational stocks would be sufficient to surge manufacturing production and commence resupply.<sup>21</sup> This was a fair estimate given the requirements and complexity of ammunition in the early 1950s and the presence, certainly within the UK, of a strong post-war heavy industry production base well capable of responding to emergency requirements.<sup>22</sup>

Nations did not meet the original 90 day target primarily due to cost; but also because there was little incentive when greater emphasis was placed from 1953 onwards upon massive nuclear retaliation when the US began deploying tactical nuclear weapons to Europe.<sup>23</sup> The formal adoption by NATO in 1956 of the nuclear response strategy,<sup>24</sup> portrayed conventional defence merely as a trip-wire designed to provide a short pause before a massive nuclear response had to be unleashed. This strategy was later called 'trip-wire'. At this time the sword and shield emblem of Allied Command Europe was taken to represent a conventional shield, with nuclear weapons providing the cutting sword.<sup>25</sup> The implication was that the conventional shield could only rebuff an attacker for a brief period.

In 1967 NATO's strategy changed from 'trip-wire' with its implications of mutually assured destruction

to one of 'flexible response'.<sup>26</sup> This change required the Allies to be able to respond to any act of aggression "with an appropriate response".<sup>27</sup> The implications being that the Alliance must possess a spectrum of forces at conventional, tactical nuclear and strategic nuclear level. This strategy, which is discussed in Chapter 1, places a greater emphasis upon conventional force as a key leg of NATO's Triad of deterrence and to quote a former SACEUR "the conventional leg of the Triad has become more important to our efforts in maintaining the credibility of our deterrent".<sup>28</sup> However, escalating costs of ammunition made the 90 day stockpile target even more difficult for nations to achieve, therefore an interim measure was agreed for nations to hold at least 30 days designated stocks.<sup>29</sup> This interim measure assumed the ability of Allied nations to 'surge' industrial production of war stocks, should it be necessary to provide a sustaining system. In both these supply areas, the level of war stocks and industrial surge capabilities, the NATO Alliance judged as a whole has proved to be woefully inadequate.<sup>30</sup>

Supply is an integral element of logistics and over time nations developed different systems for classifying stocks and equipment often under the generic term of supplies. The UK tends to group supplies under named headings; engineer stores,

combat supplies, medical stores etc; whereas the US have ten designated classes. To prevent confusion and to aid logistic planning, particularly in areas of stockpile planning guidance and logistic reporting, NATO has adopted a simple method of categorizing supplies into five class groups for land forces published in STANAG 2961<sup>31</sup> and shown in figure 4.0. Within the 'logistics is a national responsibility' agreement, some nations still adhere to their national names for supplies. However, logistic reports and directives within NATO commands all use the five class system for land force supplies.

The most important classes of supply in terms of volume and ability to maintain battlefield fighting power are Class I, III, V eg; rations, fuel and ammunition; for "without these a modern battle soon comes to a stand-still".<sup>32</sup> NATO stockpile planning guidance places greater emphasis upon fuel and ammunition due to its sheer size and cost. The document titled SHAPE Guidance for Stockpile Planning in ACE<sup>33</sup> outlines the methods for calculating supplies required to meet anticipated war-time demands. The second section deals specifically with stockpile planning data for land forces. For Class III (fuel) the Guidance details the basic measure known as the Fuel Consumption Unit; and for Class V (ammunition) it includes the formula for the calculation of basic



## CLASSES OF SUPPLY OF NATO LAND FORCES

### Class I

Items which are consumed by personnel or animals at an approximately uniform rate, irrespective of local changes in combat or terrain conditions, eg; food and forage.

### Class II

Supplies for which allowances are established by tables of organization and equipment, eg; clothing, weapons, tools, spare parts, vehicles, etc.

### Class III

Fuel and lubricants for all purposes, except for operating aircraft or for use in weapons such as flame throwers, eg; gasoline, fuel oil, greases, coal and coke, etc. For Air Force IIIA: aviation fuels and lubricants.

### Class IV

Supplies for which initial issue allowances are not prescribed by approved issue tables. Normally includes fortification and construction materials, as well as additional quantities of items identical to those authorized for initial issue (Class II), such as additional vehicles.

### Class V

Ammunition, explosives and chemical agents of all types.

(Source: NATO Standardization Agreement 2961)

Figure 4.0

stocks for various weapon types. Basic stocks are defined as "those stocks required by MNC's to support the execution of approved operational plans for an initial pre-determined period."<sup>34</sup>

For fuel planning, the use of a Fuel Consumption Unit (FCU) has been agreed by a NATO Standardization Agreement which essentially provides a measure by determining the fuel consumed by vehicles motoring 100 kms on flat European roads. The number of vehicles in a formation (Brigade, Division, Corps) are added up to provide a total to which factors are applied. These factors include geographic considerations eg; terrain and temperature, and also an intensity factor to cover battlefield activity levels.<sup>35</sup> This FCU methodology has the advantage of being simple, and provides a reliable planning base-line applicable to major sized formations at NATO operational level. US moves to computer model the variables to produce an accurate FCU assessment in appearance may well unnecessarily complicate current NATO planning and encourage countries to determine their own requirements level. The danger is that the more complex the input data the more room for error or amendment. This is particularly relevant in a high expenditure area prone to political/economic national interest where data could be massaged to suit a purse. Simple methodology provides simple NATO checks. The view expressed by UK's Chief of Defence Staff

to the House of Commons Defence Committee represents one perspective:

Fuel Stocks is something which at this moment you could possibly take some risks with, because there is a great deal of fuel in the world and everybody has masses of stocks and you could afford to run these down without undue risk, but you will have to run them up again at some stage so you will have to meet the cost of that then.<sup>36</sup>

The method of calculating the quantitative requirements of ammunition to meet anticipated battlefield consumption and attrition is even more complex. There were originally two separate stockpile planning calculations for the two main types of weapon systems; indirect fire and direct fire. However, an additional two planning methods have been added in recent years as munitions became more complex. The four types of ammunition calculations currently used by NATO are termed:

Level-of effort Munitions. In stockpile planning, munitions stocked on the basis of expected daily expenditure rate, the number of combat days and the attrition rate assumed, to counter targets the number of which is unknown. This method applies to indirect fire weapons.

Lifetime-Oriented Munitions. In stockpile planning, munitions stock for all direct fire and force weapons which each have finite life in combat, defined as an average number of engagements, the requirements being the sum of munitions expended or lost during all the engagements the weapon is in until it is destroyed.

Threat-Oriented Munitions. In stockpile planning, munitions intended to neutralise a finite assessed threat and for which the total requirement is determined by an agreed mathematical model. SHORAD munitions are an example.

Target-Oriented Munitions. In stockpile planning, munitions intended to neutralise a finite assessed amount of targets and for which the total requirement is determined by an agreed mathematical model.<sup>37</sup>

For stockpile planning the largest requirement in the terms of volume and quantity is level-of effort munitions which applies to indirect fire weapons eg; field artillery. The method of computation includes assessing the number of rounds a howitzer could fire for a mission, determining the number of missions feasible within one day, projecting this quantity for a given number of combat days and applying the resultant to the number of guns, taking into account attrition considerations. It has been suggested by some UK observers that the final result, the standard NATO rate, is low and does not reflect recent historical experience:

Even a campaign as limited as the Falklands quickly exhausted some categories of munitions. The Armed Forces themselves concede that some of their holdings are below agreed levels, which are themselves below realistic requirements.<sup>38</sup>

The implications of the last eight words of this statement were strongly re-buffed by NATO's former

Director of Logistics.<sup>39</sup> However, the main result of the present stock level methodology, irrespective of stance, is that Allied nations are at least working to the same definitive guidance.

The factors which influence the stockpile guidance of lifetime-orientated munitions is even more complex. Determining the combat life of direct fire weapons, which includes main battle tanks, is a scientific study area of its own. Important considerations are speed of target acquisition, first round kill probability and battle field survivability. Twenty five years ago a tank gunner would have been judged a marksman had he regularly achieved a second round hit when 3 shots was the average. Today anything less than a 90% first round hit rate is considered poor.<sup>40</sup> Enhanced accuracy is a significant factor in determining the quantity of munitions required to counter the threat.

\* \* \*

The SHAPE Guidance for Stockpile Planning<sup>41</sup> provides the formula and methods of calculating anticipated fuel and ammunition expenditure which, with the exception of lifetime-oriented munitions, applies the timescale of a combat day. The determination of the actual number of days stocks Allied nations should



hold to meet the operational plan is a political decision, and these requirements are laid down by NATO Headquarters in other publications. An important document MC55/2, Military Planning Factors sets out the policy on theatre operational stocks and the various categories of readiness of forces. See Figure 4.1.

The first concern of NATO's logistic planners is for nations to hold sufficient supplies of operational stocks for the initial predetermined period of combat ie; basic stocks; and then to have enough additional stocks available<sup>42</sup> until resupply can commence from increased procurement or enhanced industrial production. It is the current inability of the Alliance to meet even the comparatively low first interim goal of 30 days ammunition stocks which has raised severe 'sustainability' concerns.<sup>43</sup> As defined by the Chairman of NATO's Military Committee, sustainability represents the ability to fight off an attack with conventional forces long enough to permit any NATO decision to escalate to theatre nuclear weapons to be made "deliberately" and "not because we are running out of munitions in the battlefield".<sup>44</sup>

The NATO agreed stock level requirements for fuel remains classified; but the number of designated combat days is significantly higher than the current

### THEATRE OPERATIONAL STOCKS

Operational Stocks as the expendable and non-expendable supplies over and above national peacetime levels which are required by MNCs to support forces allocated to NATO for the execution of approved operational plans and are further sub-divided into:

Basic Stocks. Those stocks required by MNCs to support the execution of approved operational plans for an initial predetermined period.

Sustaining Stocks. Those stocks required by MNCs to support the execution of approved operational plans beyond the initial predetermined period until resupply is available for support of continued operations within each area.

Resupply as covering the nations' responsibilities for the continuous support of their forces giving consideration to all foreseeable war-time contingencies. Resupply arrangements could comprise a wide variety of measures, ranging from additional stockpiling to standby procurement or production.

(Source: NATO document MC 55/2, Military Planning Factors).

Figure 4.1

ammunition stockpile goal.<sup>45</sup> There is a perception that because industrialized Europe has enormous fuel reserves that war-time supplies for NATO forces would pose few problems. Indeed a European Commission 1972 directive specifies that:

Western European Countries must maintain a mandatory stock level equivalent to 90 days domestic consumption in the previous calendar years.<sup>46</sup>

The military requirement is that its war reserves of fuel should, where possible, be stored in dispersed, protected or hardened facilities. This is achieved by using the NATO common-funded Central Europe Pipeline System (CEPS) which is a distribution and storage facility. It comprises over 6,000 km of buried high pressure pipelines, 100 main pump stations and approximately 60 storage depots connected to ports, airfields, truck, train and barge facilities spanning 5 countries (BE, FR, GE, LU and NL), and serving the eight nations deployed in Central Europe. See Figure 4.2. It has been noted that "it would take over 13,000 rail cars to carry the fuel that is in the pipes alone",<sup>47</sup> but the fundamental advantage of the CEPs is not the quantity of fuel it can move and store; but a system built specifically for a military task:

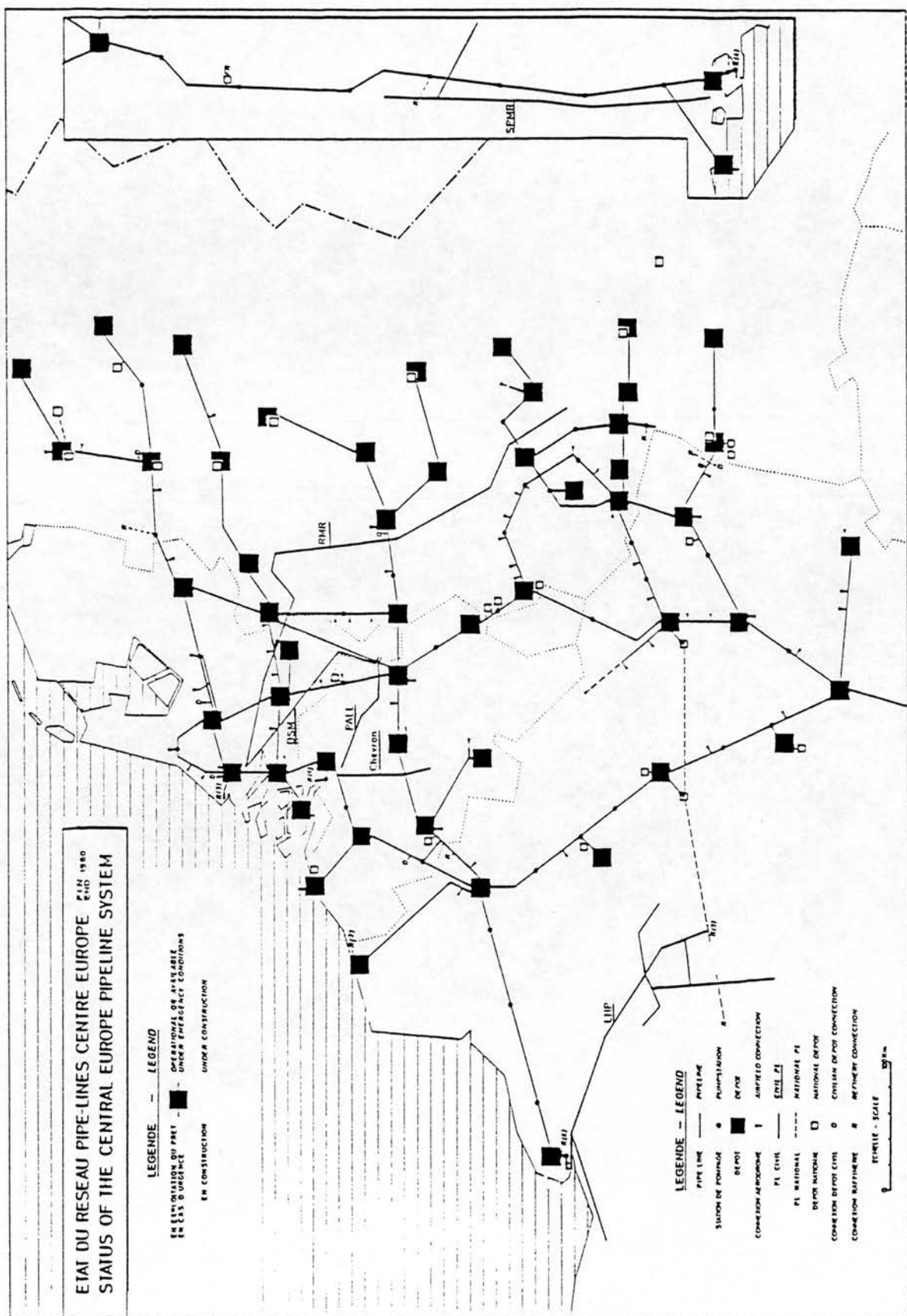


Figure 4.2

They are designed, constructed and operated in accordance with criteria established by NATO military authorities to meet clearly defined, but dynamic storage and delivery requirements. The facilities offer a measure of protection, operate independently from commercial power sources, and provide flexibility in both receiving and delivering fuels, thereby contrasting with their commercial counterparts.<sup>48</sup>

For logistic stock level planning, the only disadvantage with the excellent CEPS is that throughput and storage capabilities would be insufficient in war-time to cope with projected demands. Enhanced battlefield mobility and new aircraft deployments (AWACS is an example) have increased forecast requirements to a level where the system could not cope. It has been estimated that both the throughput capacity and the storage capacity needs to be doubled to meet current NATO war-time plans.<sup>49</sup> Logistic planners in NATO have been seeking ways and means to limit this deficiency area. A common-funded enhancement of pipeline diameter, pumps and storage takes time and the expenditure must be matched against many priorities. At the time of writing, two ideas were under development which might ease the present problem.

The first is to improve fuel storage and delivery flexibility within the CEPS and on the battlefield by standardizing fuel. A 'Single Fuel Concept'



adopted by the NATO Pipeline Committee in May 1987 proposed to move from a three fuel system (Jet, Diesel and Gasoline) to a single product. This important initiative is outlined in NATO's Single Fuel Concept document at Appendix A to this Chapter. The single fuel goal which has far-reaching, but positive logistic stock level implications is worded as follows:

To achieve equipment interoperability through a single fuel for use on the battlefield and for land based air operations, ensuring that the specification of that fuel is standardized with its commercial equivalent in common use in NATO Europe, and that its physical and chemical characteristics are such that it can be introduced, stored, transported and distributed by the NATO Pipeline System (NPS).<sup>50</sup>

The second innovation concerns a NATO trial of recent technology to enhance pipeline throughput by introducing a flow improver. The addition of diluted high-molecular polymer solutions on the output side of a pipeline pump has been found to decrease energy loss due to turbulence, and increase product throughput at constant pressure. A Pipeline Drag Reducer (PDR) was introduced into a section of the CEPS in Germany in November 1988. The initial results showed a flow increase in excess of 45% when 50 parts per million PDR was introduced in diesel fuel.<sup>51</sup> The manufacturers of PDR advise that

laboratory engine tests show no detrimental effect upon the life or performance of engines.<sup>52</sup> It has also been suggested that dilute polymer solutions could reduce mist ignition properties in fuel,<sup>53</sup> an additional safety factor particularly applicable to aircraft. Further tests are taking place within NATO, however these two initiatives could significantly influence fuel support in the Central Region by enhancing flexibility and distribution in throughput.

While NATO logistic planners' concern with fuel centres upon the problems of distribution and hardened storage for what is in general an adequacy of Class III supplies,<sup>54</sup> the Class V planner is faced with difficulties of a different kind. These are primarily coping with nations inability or unwillingness to meet the Allied agreed interim stockpile target to hold a minimum of 30 days ammunition stocks.<sup>55</sup> This relates directly to the length of time NATO could wage conventional operations. General Rogers as SACEUR repeatedly drew attention to sustainability problems:

We will defend. I think in an admirable way as long as we can defend. I think it is in that first X number of days - before we run out of ammunition... we will fight very well... But lack of adequate sustainability is our major deficiency.<sup>56</sup>

General Roger's successor as SACEUR, General Galvin has made a similar appreciation about the length of time the Alliance could conduct an effective defence and underlined the necessity to improve ammunition stockpiles: "NATO has enough of these critical supplies to last only a relatively few days".<sup>57</sup> To compound NATO logistic planners' problems, the interim aiming point of stockpiling 30 days Class V supplies represents basic stocks only - and ignores the additional need for nations to provide sustaining stocks until a resupply can commence from industrial production and procurement. Although modern technology places emphasis upon manufacturing efficiency with the benefits of CAD/CAM, switching automated manufacturing to ammunition production in times of crisis is no mean task.

The UK and most other European countries were more capable of swiftly increasing their ammunition manufacturer, known as 'surge' production, in the 1940s than they are today.<sup>58</sup> This is due to two main reasons; firstly, the earlier heavy industrial technology provided a more simple framework for expansion; secondly, the indications are that today a market forces policy has encouraged the European nations of NATO to rely upon East European suppliers for explosive fillers at the expense of their own declining ammunition production base.<sup>59</sup> In summary, the required sustaining

stocks time-frame is extending as NATO's industrial ammunition production base is declining when, in American terms, the Alliance is not even touching first base by meeting the basic stock goals which themselves are perceived to be a low interim target.<sup>60</sup>

Although NATO has provided a fulsome definition of sustainability discussed in Chapter 2, the word 'sustain' entered the English language in the 13th Century via old French from Latin *sustinere* meaning to hold up; *sus plus tenere* (to hold).<sup>61</sup> In its truest sense ammunition stocks are needed to hold up conventional operations until resupply from industry can commence thus easing the reliance presently placed on the second leg of the NATO Triad. Allied nations do not object to this principle and they regularly affirm their commitment to meeting the agreed stockpile goals.<sup>62</sup> It is simply that in the real world of costs and budgets, stockpiling Class V supplies represents a very heavy financial burden. According to one report, consumption by a US six gun 155 mm howitzer battery of a mix of modern munitions would expend \$4 m in one week of war in Europe, and that was computed at 1983 prices.<sup>63</sup>

The actual level of stocks each nation holds towards meeting the Class V requirement of 30 days is declared by each country in NATO's integrated

military structure in response to NATO's annual Defence Planning Questionnaire (DPQ).<sup>64</sup> The consolidated figures provide an assessment of NATO's logistics posture which is brought to the attention of ministers through the North Atlantic Council and features in the yearly NATO Defence Planning Review.<sup>65</sup> Studies covering the capability of the Alliance for industrial ammunition production are undertaken by a separate committee, the Industrial Planning Committee.<sup>66</sup>

The ammunition stock-level situation creates a ground-swell of concern within NATO military and civilian circles, which has been reflected in some speeches of senior NATO personnel emphasizing that Class V stocks are inadequate and the European ammunition production base is declining. In addition the application of a market forces philosophy in Western Europe has seen some NATO nations placing significant reliance upon ammunition fillers obtained from Warsaw Pact countries. These developments occurring at a time when NATO's tactical nuclear weapon strength has been reduced or remains unmodernized has a certain poignancy of its own.<sup>67</sup>

The present situation is that, in a short or medium warning scenario, the Allies in Central Europe would have to make a conventional defence with what ammuni-



tion stocks they hold now. A re-supply cannot be guaranteed. The only methods available for NATO to enhance logistic sustainability in the immediate future is for nations to either increase their current ammunition stock-levels or to manage existing resources in a more efficient manner by enhancing cooperation, control and mobility of vital stocks. It is the latter - control and mobility, which proved to be the core of the matter.

\* \* \*

While it has been noted that the English language recognizes 'to sustain', and the NATO Alliance has a general definition for the military concept 'sustainability',<sup>68</sup> it is reported that the Soviet Union lacks an authoritative translation in Russian. A study by 20 experts<sup>69</sup> concluded that the nearest comparison centred upon 'viability' defined in the Soviet Military Encyclopaedia as:

Zhivuchest '(mil)'. The capability of troops (forces), weapons, military equipment, rear installations or command and control systems to preserve or quickly restore their combat capacity (the capability to fulfill their appropriate military task).<sup>70</sup>

A phrase contained in the Soviet Union book of military tactics<sup>71</sup> has also been noted as relevant to

the sustainability concept; "Podderzhanie i svoevremennoye vosstanovleniye boyesposobnosti voystk", meaning the maintenance and timely restoration of the combat capability of forces".<sup>72</sup>

Whatever term or name the Russians give to the provision of logistic support for ground forces, today's available stockpile of conventional ammunition and fuel for its numerically larger forces,<sup>73</sup> certainly in the Western Theatre of Military Operations (TVD) opposite NATO, is greater than the Allies resources by a factor of about 4:1. In addition the Warsaw Pact nations have a philosophy and control of state industrial production which should enable factories to be swiftly harnessed to meet military requirements in times of war or tension. The Warsaw Pact level of war stocks is based, in the same way as NATO's early assessment, upon the logistic experience of the Second World War and the time needed to surge manufacturing production to commence re-supply:

It is stipulated that strategic and state reserves must be adequate to supply the Armed Forces until industry is able to expand its production and meet war-time supply demands. In World War II this period was approximately 90 days of supply.<sup>74</sup>

It is significant that Soviet Union planners 3 month figure is similar to NATO's original assessment which

was made at a time when the West European heavy industry base was stronger and more readily responsive to emergency requirements.<sup>75</sup> Although NATO amended its initial stockpile aim to an interim target of at least 30 days of supply for Class V, all the evidence suggests that the Warsaw Pact has retained its goal based upon historical experience, to hold "at least a 90 day supply of ammunition, fuel, technical supplies etc".<sup>76</sup>

The US Department of Defense has noted that since 1980 there has been an upsurge in Soviet ground forces ammunition stocks which are designed to reflect a military doctrine requiring the pre-stocking of 60 to 90 days of conventional ammunition.<sup>77</sup> The figure of between 60 and 90 days ammunition stocks held in the Western TVD i.e.; over 3 million metric tons, appears in a number of US and UK publications.<sup>78</sup>

The UK government tends to play down the Soviet Unions' military logistics capabilities. However, it has drawn attention to logistic stocks in the 1989 Statement on the Defence Estimates. This noted that Warsaw Pact ammunition stocks in Central Europe had doubled between 1970 and 1984 and that forward-based stocks "should be enough to support a major offensive for at least 2 weeks".<sup>79</sup> This statement is not incorrect, but could be regarded in the same vein

that the writer or reader is at least 3 ft (1 m for Europeans) tall. The document also notes that "the present infrastructure could meet the demands of high intensity war for about 2 months".<sup>80</sup> Decoded, this adds up to a declaration that there are enough forward-based ammunition supply dumps in the Western TVD, which if stocked, could support 60 to 90 days of war; but because the UK is not sure that the bunkers are full a political 'best case' is propounded in preference to a military 'worst case'. This slightly slanted view could perhaps be explained against the political background where the same Defence Estimates shows forecast production expenditure on ammunition, mines and explosives to be lower in 1988-89 by 29.7% than the average expenditure over the last 7 years and it is scheduled to be 33.3% less in 1989/90 when compared with the same period.<sup>81</sup> Similarly the actual defence expenditure on petroleum products in 1987-88 was 42.2% less than the average of the previous 7 years.<sup>82</sup> These reduced national allocations for vital logistic stocks does not sit easily with a true recognition as noted by the Commons Defence Committee in discussions with senior officials and the Secretary of State for Defence, that Soviet sustainability in Central Europe has increased "to between 60 and 90 days war-fighting capability".<sup>83</sup>

Paradoxically, the unilateral cuts in the Soviet

Forces announced by Mr Gorbachev in his December 1988 United Nations speech have increased the staying power or sustainability of the remaining troops. The adoption of a doctrine of 'reasonable sufficiency', together with overall cuts by 1991 of 500,000 personnel, 10,000 tanks, 8,500 artillery pieces and 800 aircraft which includes 50,000 men and 5,000 tanks from East Germany, Hungary, Czechoslovakia has "done nothing to alter the aggressive deployment, material and logistics of their forces in Central Europe".<sup>84</sup> A similar comment to the effect that there is no evidence to show cut-backs in Soviet Forces military stockpiles appears in UK's 1989 Statement on the Defence Estimates:

We have no evidence of any cutbacks in military stockpiles, despite public emphasis on "reasonable sufficiency". The logistic capability of the Warsaw Pact, which far surpasses that of NATO, is crucial to its continuing ability to wage a sustained and large-scale offensive with the minimum of warning.<sup>85</sup>

This concern has also been raised by General John Galvin, Supreme Allied Commander in Europe who has argued that the Warsaw Pact's forward-based ammunition and supply dumps are quite unnecessary for defence.<sup>86</sup> The fact is that vast logistic stockpiles can now support the still sizeable theatre



troops for a longer period or, as is more likely, provide support for reinforcements swiftly re-deployed from the Soviet Union. Indeed it can be argued that Soviet logistic sufficiency is more than reasonable for conventional defence.

While the size of Soviet war stocks is based upon an operational plan and the time determined for the State to activate war-time industrial production (assessed as 90 days), the shape of ammunition stocks in terms of number of rounds needed to meet the agreed timescale is based on a system of scientific study and theory linked to historical experience. The Russian approach to stockpile planning is founded upon a declared Marxist-Leninist philosophy which includes scientific analyses of all the identifiable variables in order to provide a valid forecast of requirements. The use of Soviet 'materialistic dialectics' in scientific forecasting requires significant operational research effort and mathematical modelling.<sup>87</sup> The net result is the production of mathematical equations to provide a guide-line of requirements for various weapon systems when employed in differing roles and circumstances. The aim being to use logic, which is defined as "the science of valid inference",<sup>88</sup> to make reasonably competent deductions in preference to broader subjective judgments or "intuitive guess-work" favoured by the West.<sup>89</sup>

\* \* \*

Although an earlier proposed NATO definition of 'sustainability' included reference to a Commander's subjective assessment,<sup>90</sup> the military planners at SHAPE responsible for stockpile guidance would not agree that guess-work, intuitive or otherwise, is involved in making reasonably competent deductions.<sup>91</sup> The Allied decision to amend the time-scale for the number of days stocks to be held was a political one. Those politicians responsible can point out that the present target is an interim measure which, by definition implies a temporary or provisional arrangement. In an event it could be argued that 'logistics is a national responsibility'<sup>92</sup> and that there is no value in setting higher targets, albeit based on logic, when nations are having difficulty in meeting an interim goal which is itself a third less than the original 'objective judgement' decreed. It has been noted that when the 90 days assessment was made, the West European heavy industry base was greater and thus production was more capable of being surged than it is today.<sup>93</sup> This situation implies that the time currently needed to maintain conventional forces in action before 'resupply'<sup>94</sup> can commence would be somewhat greater than 3 months. This places General Rogers military concern about requesting nuclear release in "terms of days, not in terms of weeks or months" into greater perspective.<sup>95</sup>

A political decision determines the size of NATO stockpiles in terms of number of days required; military judgements influence the shape of ammunition stocks in rounds per weapon system and these requirements are promulgated to the Allied forces in NATO's Central Region through the document SHAPE Guidance for Stockpile Planning in ACE.<sup>96</sup> As discussed some munitions are stocked on the basis of an assessed lifetime of the weapons system ie; a Main Battle Tank, and others are either threat orientated, target-orientated or level-of effort munitions. The latter applies to indirect fire weapons such as artillery, and is related to a daily expenditure rate. It is in this area that a significant number of mainly British reservations have been expressed, implying the SHAPE Guidance figure for daily artillery consumption is low in the light of recent historical experience and forecast intensity levels for modern warfare in Central Europe.

In the early 1980s there were rumblings that the NATO consumption figures were inadequate "given the rates experienced in the 1973 Arab-Israeli conflict".<sup>97</sup> Two British studies commissioned by the Director of Military Operations and completed in 1981 examined the probable ammunition and equipment expenditure at high intensity in BAOR. The projects which included an estimation of attrition losses were named the

Battle Attrition Study (BAS) and the related Review of Ammunition Rates Scales (RARS). The studies generally known as 'BAS and RARS' recommended:

Very large increases in artillery daily ammunition expenditure rates (DAERs). In the case of M109 eg; the rates were trebled. The quantity now recommended to be held on wheels with the battery has increased to about 3 times what can currently be carried.<sup>98</sup>

The implied three-fold increase above the NATO levels, certainly for 155 mm munitions, caused some British military logisticians to doubt that the BAS/RARS results would be passed-on to NATO planning staff. The political/economic considerations were significant. However, the Rt Hon George Younger, TD, MP, as Secretary of State for Defence, in evidence to the House of Commons Defence Committee confirmed that the UK's experience of the Falklands which implies BAS/RARS considerations had been made available to NATO, but war stocks had not been altered.<sup>99</sup> The telling remark made at the time by Dr John Gilbert, a member of the Defence Committee was: "I consider myself that NATO normal rates are fiction, it is the real thing which matters, which is the intensive rates".<sup>100</sup>

A similar theme is taken by Anthony Cordesman in his 1988 book NATO's Central Region Forces where he

notes that the Netherlands Army "hopes to reach NATO ammunition standards of 30 days (about 15 days of actual combat)".<sup>101</sup> He is even more forthright concerning UK levels of 155 mm munitions, however the comment confirms the disparity between the SHAPE Guidance and British National BAS/RARS rates:

It also has severe ammunition shortages, and its planned daily consumption rates owe more to the influence of its budget officers than its artillery experts. In spite of claims to higher stock-levels, the UK only has about 8-12 days worth of ammunition for intensive conventional combat at the levels likely to be consumed in the Central Region.<sup>102</sup>

It is interesting to note that despite the mainly British criticism of the accuracy of the SHAPE Guidance for level-of effort munitions, NATO has not seen fit to amend the planning goal. Perhaps a change of target by a factor of two or three when the majority of Allied nations have not achieved the basic level may be counter-productive. Certainly the political will seems to be influenced by the economic realities as noted by Mr Younger" ...NATO's desirable level of stocks is an expensive thing which eats up a great deal of money which one wishes to spend on equipment".<sup>103</sup>

As a costing guideline taking a US Army approved scenario for a M109 in Europe firing 300 rounds per



gun per day, a British 3 gun section would expend at UK prices in excess of £1 million on munitions for just that one day.<sup>104</sup> Defence is expensive, but the Allies slow advance towards meeting its agreed 'low' goal of achieving the minimum of 30 days stocks is surprising given the conventional sustainability of the Warsaw Pact forces. National responses to the 1988 DPQ concerning battle decisive munitions indicate that out of all the countries in the NATO Alliance "only the United States plans to achieve stock-level targets by 1993".<sup>105</sup>

In the final analysis it is not the methodology used by NATO to determine the military requirements which is important. Cooperation and political will make things happen and, in the words of Belgium's former Chief of Defence Staff, General Willy Gontier, (on logistics) "it also depends on the budget funds the nation is willing to give its Armed Forces".<sup>106</sup> The level of the nations' economic commitment to the Alliance has recently received greater prominence, for a variety of reasons, under the term 'burden-sharing' - a term used by those carrying a heavy load to get someone else to help.

\* \* \*

The burden-sharing debate is political in its back-

ground and this section begins with a comment from the former US Ambassador to NATO, the Hon Alton Keel:

Since the beginning of this Alliance nearly 40 years ago, member countries have readily agreed that all must share in the risks, roles and responsibilities associated with the defence of the NATO region. Despite widespread support for this basic principle, differences have periodically risen over whether every nation is carrying its fair share of the collective burden.<sup>107</sup>

Although sentiments of Burden Sharing may be influenced by economic considerations, the present re-emergence of the debate is sheer politics.<sup>108</sup> Burden-sharing within the Alliance has been described by one defence analyst as "arguments to convince others to do more, thus to do less themselves".<sup>109</sup> Certainly the urge to do less must surely be present when the acknowledged leaders of the NATO Alliance are facing huge budget deficits described in one 1987 economic assessment to "have pushed the United States in just 3 years from being the world's largest creditor to being the world's biggest debtor".<sup>110</sup> This upset occurring during the run-up to and during the US Presidential election provided a political focus of significant dimensions. Senator Reid, who was interviewed by a North Atlantic Assembly Sub-Committee in November 1987, predicted that burden-sharing would become an issue during the US election campaign,<sup>111</sup>

and was proved correct. Senator Dole reportedly brought a listless crowd to life in Charlotte, North Carolina, by criticising the NATO Allies, "We can't pick up the tab for everyone",<sup>112</sup> and the Deputy Secretary of Defence in the Reagan administration noted, on burden-sharing, that it would be a "mistake to think that this will not be a major issue in political discussion next year - it will be".<sup>113</sup> This prediction has also proved correct.

It was the result of growing political pressure in US Congress and not the economic factors which prompted the Reagan Administration to create a special commission in the Department of Defence headed by Deputy Secretary William H Taft IV. The commission visited Allied capitals and NATO Headquarters in May 1988 in order to underline the need to make a convincing response to Congress that the Europeans were indeed making fair contributions to their own defence.<sup>114</sup> NATO's response was the establishment of an Executive Working Group of the Defence Planning Committee which was tasked to explore the issue and make recommendations. This resulted in the report made to NATO Defence Ministers meeting in December 1988 on which the official communiqué included the following statement:

Central to our discussions has been the

need for all Alliance members to share equitably the roles, risks and responsibilities, as well as the benefits, of our collective defence. This fundamental principle was the basis for the preparation of a wide-ranging and major report on enhancing NATO's collective security. This report, which we have agreed and which has been published, addressed the perceptions and realities involved in the fair sharing of the burdens and benefits of Alliance membership. It concludes that, as the Alliance approaches its 40th Anniversary, its strength and cohesion remain as firm as ever with major contributions being made by both the European and North American pillars of the Alliance. Nevertheless, the report has also shown that there are significant variations among countries in the scale and nature of their contributions, and has identified a number of areas where further improvements could be made to strengthen the Alliance's defence capability.

The report emphasises the need to provide adequate resources for defence and to use them as efficiently as possible.<sup>115</sup>

The NATO report entitled 'Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance'<sup>116</sup> represents the European and NATO reaction to the US Administrations' political request to counter pressure in Congress to reduce US military spending in Europe. From the time of the Taft commissions first visit to NATO in May 1988 (there were two visits) and the publication of the report 'Enhancing Alliance Collective Security', the US Administration faced increased political congressional pressure when the Defence Burden-Sharing Panel of the House Armed Services Committee, chaired by Representative Patricia Schroeder, issued its interim

report in August 1988.<sup>117</sup> The report gives a clear view on the US Congressional position by stating:

Our Allies are not sufficiently aware of the strong political pressure in this country to reduce our defence commitments to our Allies unless they are willing to shoulder more of the burden. This view is shared by the Congress.<sup>118</sup>

The Allies were, infact, well aware of strong Congressional pressure upon the US Administration as they had responded to the Taft commission request to try and find a formula to appease Congress. The carefully crafted result in the form of 'Enhancing Alliance Collective Security' changes the emphasis from spending to performance and has been praised by a senior US official, who said "the report's 'Candor will impress even critics' in Congress".<sup>119</sup> However, it is emphasised that the Burden-Sharing debate is essentially a political initiative.

Although the burden-sharing topic has surfaced from time to time, almost since the formation of the Alliance;<sup>120</sup> it is significant that the US Government, as opposed to Congress, has only infrequently criticised its Allies efforts. The report of the Secretary of Defence to Congress on the 1986 Budget, 1987 Authorization Request and 1986-90 Defence Programs recorded that:



we believe the record shows that our European Allies are doing more for the common defence, broadly defined than they are often given credit for.<sup>121</sup>

In a later report to the US Congress on Allied Contributions to the Common Defence in discussing the Allied effort, the Secretary of Defense noted "the comparisons also reveal that the non-US NATO Allies as a group are shouldering roughly their fair share of the NATO and Japan defence burden".<sup>122</sup> These views reflect a pragmatism and recognition of the European Allies defence outputs as opposed to defence inputs. It is the latter which tends to dominate economic assessments using the measurement of defence spending as a proportion of Gross Domestic Product (D/GDP). The Schroeder report in particular uses this indicator to criticise the Allies' contributions and superficially the figures do lead to the conclusion that America leads, see figure 4.3.

It is not the intention to compare the economic/accountancy aspects of the debate as these elements have received structured analysis in a number of works.<sup>123</sup> However, when a D/GDP comparison is made the following factors should be borne in mind. First, the US is a global superpower and uses its 'defence' assets to project its power world wide. The percentage of the defence budget spent on its commitment

Defence Expenditures as % of GDP

(based on current prices)

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average 78-87	Average 83-87
Belgium	3.34	3.34	3.35	3.52	3.40	3.32	3.15	3.05	3.03	2.99	2.87	3.25	3.11
Canada	1.94	1.83	1.88	1.91	2.10	2.19	2.21	2.17	2.17	2.13	2.08	2.05	2.17
Denmark	2.41	2.32	2.44	2.53	2.51	2.45	2.31	2.15	2.00	2.11	2.17	2.32	2.20
Germany	3.35	3.26	3.28	3.39	3.39	3.37	3.26	3.20	3.10	3.05	2.98	3.26	3.20
Greece	6.70	6.28	5.67	6.97	6.85	6.28	7.15	6.97	6.11	6.15	6.59	6.50	6.52
Italy	2.07	2.08	2.10	2.11	2.26	2.28	2.28	2.31	2.24	2.44	2.39	2.21	2.31
Luxembourg	1.03	1.02	1.15	1.21	1.19	1.20	1.15	1.09	1.08	1.21	1.27	1.13	1.15
Netherlands	3.08	3.20	3.11	3.20	3.23	3.19	3.19	3.10	3.05	3.05	2.99	3.14	3.11
Norway	3.22	3.08	2.89	2.89	3.02	3.08	2.80	3.08	3.11	3.36	3.28	3.05	3.08
Portugal	3.47	3.46	3.46	3.46	3.45	3.34	3.28	3.16	3.20	3.11	3.13	3.34	3.22
Spain	2.03	2.13	2.30	2.36	2.38	2.43	2.37	2.42	2.24	2.40	2.20	2.31	2.37
Turkey	5.43	4.55	4.58	5.11	5.13	4.82	4.37	4.44	4.77	4.44	4.37	4.75	4.56
United Kingdom	4.61	4.85	5.02	5.14	5.39	5.28	5.49	5.23	4.99	4.73	4.48	5.07	5.14
United States	4.80	4.80	5.14	5.40	6.09	6.37	6.22	6.52	6.72	6.50	6.07	5.81	6.46

Defence Expenditures as % of GDP

(based on constant prices)

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average 78-87	Average 83-87
Belgium	3.43	3.43	3.35	3.43	3.37	3.36	3.24	3.20	3.27	3.24	3.10	3.33	3.26
Canada	1.90	1.82	1.88	1.91	2.10	2.19	2.21	2.17	2.17	2.13	2.08	2.04	2.17
Denmark	2.49	2.41	2.44	2.47	2.40	2.36	2.22	2.16	2.08	2.15	2.22	2.32	2.20
Germany	3.35	3.26	3.28	3.39	3.39	3.37	3.26	3.20	3.10	3.05	2.98	3.26	3.20
Greece	6.70	6.28	5.67	6.97	6.85	6.28	7.15	6.97	6.11	6.15	6.59	6.50	6.52
Italy	2.13	2.08	2.10	2.07	2.13	2.17	2.15	2.16	2.12	2.18	2.10	2.13	2.16
Luxembourg	1.00	1.00	1.15	1.21	1.24	1.25	1.18	1.12	1.11	1.23	1.29	1.15	1.18
Netherlands	3.15	3.21	3.11	3.26	3.38	3.35	3.25	3.28	3.33	3.30	3.26	3.27	3.32
Norway	3.05	2.96	2.89	2.95	3.05	3.04	2.74	2.99	2.82	3.11	3.06	2.96	2.93
Portugal	3.44	3.42	3.46	3.46	3.45	3.34	3.28	3.16	3.20	3.11	3.13	3.33	3.22
Spain	2.03	2.13	2.30	2.36	2.38	2.43	2.37	2.42	2.24	2.40	2.20	2.31	2.37
Turkey	4.41	4.57	4.58	4.48	4.48	4.14	3.86	3.99	4.17	3.83	3.87	4.24	4.00
United Kingdom	4.73	4.78	5.02	5.15	5.40	5.24	5.33	5.14	4.83	4.54	4.26	5.01	5.01
United States	4.87	4.93	5.14	5.19	5.69	5.90	5.77	6.00	6.21	6.05	5.59	5.55	5.98

Source - A Report by NATO's Defence  
Planning Committee, December 1988

Figure 4.3

to NATO varies between 50% and 60% depending upon which source is used.<sup>124</sup> However, a withdrawal from Europe would not realistically see a 50% to 60% saving given America's global aspirations. A figure between 30% to 35% would be more appropriate; and this in truth represents the real burden the US is sharing with its Allies. If the Federal Republic of Germany chose to leave NATO it would not save a dollar and the same argument applies to Spain and Turkey. Holland would save about 50% of its defence budget with cuts in offensive aircraft but not in air defence. Second, the D/GDP for the US includes a significant slice for nuclear assets, many of which are outside European territory. The US policy does not encourage each European Ally to have its own nuclear capability and indeed it has never asked for a common Alliance responsibility outside the European territory.

The comparison of inputs verses outputs in defence is a well worn track,<sup>125</sup> where attention is drawn to the European use of conscripts to save costs; and the loss of rents and environmental considerations with low flying and exercise damage in the Federal Republic of Germany.<sup>126</sup> All these variables assist in making Ambassador Keel's statements true:

There are no universal criteria for assessing national contributions. A variety of quantitative and qualitative

measures have been proffered as reasonable measures, but none command universal support... In any event, there is presently no definitive means of determining whether the burdens of the Alliance are equitably distributed.<sup>127</sup>

It is scientifically difficult to draw conclusions from political discussions, especially when the debate itself is basically confused. The political burden-sharing debate is confused by:

- One, the US global power projection of which NATO is only an element.
- Two, the unwillingness of NATO nations to be drawn into world wide responsibilities which they have not agreed.
- Three, US nuclear policy which has not asked for a NATO responsibility outside the European area.

Examining these three specific areas in turn. Firstly, it is not fully appreciated that US defence strategy has a world wide perspective, of which NATO is only a part. Indeed the prestigious US Commission on Integrated Long-Term Strategy co-chaired by Under Secretary of Defence Fred C. Ikle and Albert Wohlstetter recorded in their January 1988 report Discriminate

Deterrence that: "Defense planning in the United States has centred for many years on a grand strategy of extraordinary global sweep".<sup>128</sup> This global power indeed global superpower projection is linked to a US assessment of national interest which has been identified by one expert to cover seven main geographic areas; North America, Western Europe, Soviet Union, East Asia and Pacific, South America, Middle East and Southern Africa.<sup>129</sup> The application of US 'intensity of interest criteria' to these areas, spanning four separate categories for each; defence of the homeland, economic well-being, favourable world order and promotion of American values, places Western Europe high in US strategic importance after North America.<sup>130</sup>

The analysis by a Professor of International Affairs at the US Federal Executive Institute serves to emphasise that NATO Europe is only one of many world wide commitments of US strategic and thus political interest. This global perspective is not fully recognized by many Europeans in NATO or indeed by the US public themselves. The US National Security Council's former Director of West European Affairs noted in May 1988 that:

...few Americans appreciate that much of US military activity does not contribute to the defence of Europe, thus dis-



torting comparisons of military effort. Nor do many in the United States take into consideration how much political influence is gained from US defence spending and foreign involvements.<sup>131</sup>

Given that the Americans in general do not fully appreciate, especially in the burden-sharing debate, the depth and scope of their country's world wide defence strategy - a political decision; it is understandable that similar myopia exists in their European Allies whose closeness to the Warsaw Pacts considerable forces naturally concentrate awareness upon the nearest apparent danger. However, within the burden-sharing debate, the US political global super-power projection and the general lack of understanding of its world wide role by the American and West European public alike represents an important factor.

Secondly, several NATO nations do not accept a world wide responsibility in the NATO forum. If one discusses a common burden, one demands a common responsibility. The fact that the European Allies are content to "defer to a considerable extent to the American lead"<sup>132</sup> within NATO is primarily due to the recognition that without the considerable commitment of the US, the defence of Europe would lack credibility. However, the European obligation within the strategic deterrence and nuclear levels does not mean that all the same Allied partners endorse the American view

that US out-of-area involvement should be considered a burden shared, given or received on behalf of NATO. A striking example of this was the European Allies reaction, except for the UK, in their reluctance to support the American raid on Libya in 1986. Another example was the Allies initial reaction to the US request for their involvement in the Persian Gulf in 1987, although several European naval forces were eventually committed, these were provided in a national rather than a NATO capacity.<sup>133</sup> However, as Stanley R. Sloan in his book entitled 'NATO's Future': towards a new transatlantic bargain has noted:

The Alliance has never had a Third World mission, initially because the United States preferred that NATO's commitments be defined within narrow geographic parameters and, in more recent years, because the European allies were not willing to expand NATO's defense commitments beyond their own resources or their domestic political base for the Alliance.<sup>134</sup>

The above comment does not mean that the US has ceased trying to involve its NATO Allies in out-of-area activities either through direct political, economic or military support or through the tacit recognition that the US, in its Third World dealings, is advancing the interests of the Western Alliance. The drawback with the US global perspective is that many of the NATO nations including Iceland, Denmark, The Netherlands and even the UK in some instances, just do not connect US dealings in, say, Nicaragua,

as having direct relevance to NATO interests.

Indeed this significant comment by the two Williams brothers sums up the situation:

...the American mining of Nicaraguan ports with the subsequent French offer to remove the mines exemplifies the growing dissension in the alliance over Third World issues.<sup>135</sup>

Because the European Allies generally acquiesce to US leadership in the NATO forum, the American perception would appear to be that the Allies should also be willing to be drawn into wider security concerns for the sake of the common good as identified by its superpower leader. However, it is suggested that the true situation is understated by Martin Edmonds in his book "NATO in the 1980s; Challenges and Responses":

The United States is in competition with the Soviet Union and has global interests, many of which, such as energy, it has in common with the European states. Nonetheless, the European governments appear reluctant to widen the scope of NATO and risk being drawn into conflicts that are potentially of greater interest to the United States than to themselves.<sup>136</sup>

The European reluctance to become involved in out-of-area activities and to extend Allied Alliance geographic commitments, has been identified by the high level US Commission on Integrated Long-Term Strategy.

The Commission, which included a number of experienced senior political figures, including ex Secretaries of State, submitted a report to the US President in 1988 entitled Discriminate Deterrence. The report referred to a "problem of cohesion" in NATO dealings with countries like Libya or Nicaragua.<sup>137</sup> This term implies that the Allies should be sticking with or to its US leader; but the Europeans would argue that there should be common agreement on common responsibilities before these burdens are commonly shared.<sup>138</sup>

The third area concerning the confused burden-sharing debate involves nuclear weapons. The US policy on nuclear defence has never asked for a common responsibility outside the European area. This policy has evolved over time. When the NATO Alliance originally came into being with the signing of the North Atlantic Treaty on the 4th April 1949, the US held a complete nuclear monopoly. While the Soviet Union exploded its own first atomic device in August 1949, it then lacked the sophisticated delivery systems capable of reaching the American homeland.<sup>139</sup> The massive nuclear response strategy adopted by NATO's Military Committee in December 1954 under the aegis of MC 48 saw the deployment of a number of tactical nuclear weapons into Europe<sup>140</sup> augmented by the US Strategic Air Forces targeting the Soviet Union. But as noted in 1957 by Henry Kissinger in his now classic book on nuclear

weapons and foreign policy:

...Our Strategic Air Command has never been a part of the NATO structure. Since the alliance has no control over the instrument around which its whole strategy is built, there has inevitably been an air of unreality about NATO planning.<sup>141</sup>

Any air of unreality soon became dissipated with the realization in the late 1950s that the Soviet Union had made such rapid technological advances, highlighted by the launch of the Sputnik satellite in 1957, that the North American continent could no longer remain immune from the threat of a Russian nuclear attack. By the time of the May 1962 meeting of Foreign and Defence Ministers of the North Atlantic Council in Athens, which assembled to "review the circumstances in which the Alliance might be compelled to have recourse to nuclear weapons (Athens Guidelines)",<sup>142</sup> the US had deployed a significant number of short and intermediate range nuclear weapons in Western Europe. The Athens Guidelines were concerned with the European Theatre of Nuclear Forces and articulated that decision-making should remain firmly in the hands of the nuclear power, but agreed that there would be Allied consultation before use.<sup>143</sup> The wishes of some European Allies to have a greater say in the nuclear planning process coupled with the US interest in reinforcing the credibility of its extended nuclear deterrence led, in



December 1966, to the creation of NATO's Nuclear Planning Group (NPG).<sup>144</sup>

A shift took place in 1967 from the strategy of massive retaliation to one of flexible response known by its NATO Military Committee designation of MC 14/3. This strategy, which is still current, focused greater attention upon the European Theatre in nuclear terms through the application of the NATO Triad which, for two of its legs envisages the use of tactical nuclear weapons which by definition are based in Europe.<sup>145</sup> The NPG is now, in 1989, a well established consultative forum; however, consultation means neither control nor responsibility and as recognized by Stanley R. Sloan who acted as the Study Director and Consultant to the North Atlantic Assembly Committee 'NATO in the 1990s':

The United States provided no iron clad guarantee about how extensive consultations might be in a crisis, but at least the NPG provided ways and means for such consultations.<sup>146</sup>

The foreign policy and worldwide strategy of the United States, concerning the use of nuclear power, does not call for a common responsibility outside the European area. However, within the burden-sharing debate, the total costs of maintaining strategic nuclear forces represents to some US Congressional

members a responsibility which should be commonly shared.

These three essentially political issues which do confuse the burden-sharing debate:

- US global power projection of which NATO is only an element.
- Unwillingness of NATO nations to be drawn into worldwide responsibilities.
- US nuclear policy.

are not addressed in the December 1988 report by NATO's Defence Planning Committee 'Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance'; but it is clear that the document was carefully written with these areas in mind.<sup>147</sup> The question of 'shares and burdens' could be regarded as 'spends' or what one is 'missing' in terms of hospitals, schools or social services, as a consequence of the funds having been expended on defence. The nature of less developed economies places greater weight upon what it is 'missing' as opposed to 'expenditure'. However, this perspective is not only applicable to the poorer nations. In May 1989 the French President had to arbitrate in an argument between his

Defence Minister and the Prime Minister who wished to transfer about £7 bn of the defence budget to education.<sup>148</sup> In the context of 'spends and missings' or 'shares and burdens' by the countries of NATO, it is emphasised that the true nature of the debate is centred on political issues in a changing economic situation. Nations 'spendings' on defence are integrated political decisions and NATO members should aim to ensure that this expenditure is tied to improved cooperation to make existing 'spends' more effective.

Burden-sharing is an area which tends to create more problems rather than to providing solutions. While the head of America's National Security Council has stated that a bigger Allied contribution, offering economies to the US defence budget, would be his main priority,<sup>149</sup> and US defence expenditure for 1990 has planned zero growth;<sup>150</sup> it is again recognised that the true nature of the burden-sharing debate is political. The December 1988 report by NATO's Defence Planning Committee represents a carefully worded political response to the US Government's political initiative where one of the main conclusions is that defence resources committed should be "used as efficiently as possible".<sup>151</sup> While this statement is obviously correct it seems that the whole burden-sharing debate provides the means for postponing a decision; however, political decisions cannot be made

without first identifying solutions.

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Working from the premise that the Allies are trying, albeit very slowly, to work towards achieving agreed ammunition stock-level goals,<sup>152</sup> it will be conceded that when resources are scarce the efficient management of them becomes far more critical as any European housewife of the Second World War can testify. The burden-sharing deliberations might well create the base for a political consensus to make decisions regarding logistic management cooperation within the Alliance. In the past the issues have become mixed and cloudy in a debate which fairly espouses "better resource management",<sup>153</sup> but fails to specify those resources which are truly critical to the Allied defence.

These resources deficiencies tend to be lumped together under the overall labels of logistics or sustainability; however, as noted at the beginning of the Chapter 'sustainability' incorporates a mix of elements including both 'consumer' and 'production' logistics. A shortened definition is:

Consumer logistics: that part of logistics concerning reception of the initial product, storage,

transport, maintenance (including repair and serviceability), operation and disposal of materiel.

Production Logistics: that part of logistics concerning research, design, development, manufacture and acceptance of materiel.<sup>154</sup>

The involvement of the latter which includes defence procurement with its attendant costs and vested interests introduces significant national political and economic pressures which, in turn, inhibits the making of true resource management improvements for consumer logistics.<sup>155</sup> Combining the term 'logistic resources' tends to create focus upon the most expensive elements, ie; the production end; while what is required is better management of 'limited resources' needed at the consumer end ie; the battlefield.

Based on Second World War experience it is clear that the most important classes of consumer logistics supply, in terms of volume and battlefield sustainability are rations (Class I), fuel (Class III) and ammunition (Class V). The provision by nations of rations does not present a problem, and regarding Class III, NATO's former Director of Logistics noted that "the problem with fuel is its distribution".<sup>156</sup> The overwhelming deficiency today centres upon a shortfall of Class V ammunition stocks and, in some Allied forces a shortage of transport to provide essential



mobility for these key resources. Senator Sam Nunn has posed the question "...why should the Americans arrive prepared to fight for 30 days only to see the ammo running out and the flanks caving in";<sup>157</sup> this question paints a slightly better picture than General Bernard Rogers' comment as SACEUR on having to request nuclear release "in terms of days, not in terms of weeks or months"<sup>158</sup> and a May 1989 report of an interview with a staff officer of the British Army of the Rhine:

If the Pact attacked us, we could hold them for 72 hours or perhaps a week, depending on how much ammunition we had, ...ammunition is a real problem.<sup>159</sup>

The disparity of views concerning the duration of ammunition stocks is understandable. Firstly, there is the mainly British perception that the intensity of conflict will upset the SHAPE Stockpile Guidance figures for indirect fire weapons by approximately a factor of three.<sup>160</sup> However, it may well be that the British view of daily ammunition expenditure rates would change if they were equipped with more guns. Indeed the SHAPE Stockpile Guidance requiring a specific number of 'rounds per tube' would eventually correlate to the number of guns one can bring to bear on target; but the number of guns is not specified. Secondly, no nation is anxious to advertise it is

dragging its feet in such a critical area. However, in the words of NATO's former Director of Logistics, "Individual nations stockpiles vary anywhere from 10 to 12 days to 30 days and beyond. It's not uniform".<sup>161</sup> While the Americans have reached an excess of 30 days for some type of ammunition, it is an open secret that at the present rate of progress, it will take its European Allies well into the next century to meet the 'interim' 30 day stockpile goal.

It is information such as this which adds fuel within US Congress to the political burden-sharing debate.<sup>162</sup> Class V ammunition supplies, therefore represent very limited resources and the management of them must be optimised within the Alliance if the duration of a conventional defence is to be extended. This statement does not imply that the strong should fully support the weak because this would reduce the nations incentives to meet their agreed stockpile obligations; what it does mean is that vital ammunition resources should be subject to more innovative management control in the interests of the Alliance as a whole.

To introduce innovative management of essential logistics may seem like proposing to turn base metal into gold, but a possible solution to the Class V ammunition problem is so relatively simple that once

discussed, the perspective becomes quite obvious. It involves shifting the sharing of burdens away from the political/economic arena towards the consumer on the battlefield for, in the words of the former Commanding General of the US Army Logistics Center, "this is by far the most important place in the logistic system - all other elements support it".<sup>163</sup> In NATO's vital Central Region eight Corps provided by five nations are ranged in what has been described as a "layer-cake" format<sup>164</sup> defensively facing the Warsaw Pact forces. The Allies are striving, with varying degrees of success, to meet agreed ammunition stockpile goals under the 'logistics is a national responsibility' policy which requires each nation to provide logistic resources for its NATO assigned troops for a specified blanket period of combat. The total combat days requirement varies by class of supply with Class V ammunition set at 30 days, and Class III fuel somewhat greater. However, these esoteric differences are, with the exception of Class I rations, quite irrelevant to the soldier in the field. What he requires, apart from daily rations, is the ready provision of ammunition and fuel when he is in contact with the enemy.<sup>165</sup> To echo Senator Sam Nunn, it is no use trying to conduct a holding operation to see the Corps on the flanks giving way through a lack of Class V supplies; but this could well represent the present situation.<sup>166</sup>

Taking a battlefield view, the Warsaw Pact could not achieve offensive momentum by attacking all eight Allied Corps simultaneously - which would be a tactical nonsense. An attacker needs to attain numerical superiority of at least 3 to 1 to have any chance of success and this is achieved by massing forces and attacking on a number of axes.<sup>167</sup> In the Central Region the 'worst case' planning figure of attack axis would be four with the probability resting upon three.<sup>168</sup> When consumable resources are expensive and scarce, it is not sound management practice to aim for a balanced stockage distribution for a 100% of outlets when the maximum pressure on expenditure can only be placed upon 50% of the whole. This is quite basic supply and transport practice as any professional retail logistics manager would agree.<sup>169</sup> The analogy may seem strange but, in truth, ammunition in combat does represent fast moving consumer goods (FMCGs). The key to enhancing the Allied Corps sustainability in terms of critical Class V supplies must involve the sharing of 'base metal' ammunition in order to achieve the 'gold' of a viable conventional defence.

Because there is no copyright on sound logistic management principles, the idea of pooling NATO supplies in one form or another has been considered in the past. However, little action followed due to

a mixture of influences of which 'timing' is a fundamental part. Some twenty years ago when NATO's flexible response strategy had just been adopted, a significant study by Geoffrey Ashcroft expressed the truism that:

The sine qua non of an integrated ammunition supply system is surely that ammunition should be allocable to where it is required, rather than in accordance with ownership.<sup>170</sup>

He continued to recommend that NATO should hold a small quantity of standard ammunition centrally which "would be susceptible to re-distribution in the interests of flexibility".<sup>171</sup> The recommendations were alas, ahead of their time for three main reasons. Firstly, the realism of 'flexible response' and the greater importance of conventional force had not fully taken root with the European members of the Alliance, who were used to relying upon the American nuclear umbrella for deterrence. Secondly, nations were more parochial about their 'national responsibility for logistics' which could be used to screen their shortfalls of resources in the international forum. Thirdly, the middle years between the end of the Second World War and today, saw a greater diversity of national weapons systems, which obviously lacked the degree of standardization a NATO 'pool' would require.



Pooling of a different nature was proposed by Steven Canby in the early 1970s. He felt that larger US battlefield manpower reserves could be produced by reducing the American divisional slice of logistic support personnel and centralizing logistic resources. His comment that "the criterion is not the ability to support every unit all the time, but to support the total force as required"<sup>172</sup> showed a ready appreciation that only part of a force in combat can be heavily engaged at any one time. His solution involving the reduction of logistic personnel in divisions was applicable to US Forces only as their support troops were greater than those of their European Allies.<sup>173</sup>

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Many minds have toyed with the idea of sharing NATO logistic stocks in one form or another in the interests of enhanced efficiency,<sup>174</sup> but real change has been hampered by a lack of political and military will linked to time and circumstances. Conditions change, and the dynamics of eased US/Soviet relations coupled with the pressures of the Alliance burden-sharing debate could well provide a catalyst for movement. The US Secretary of Defense Annual Report to the Congress of Fiscal Year 1990, which was written after the Publication of NATO's Defence Planning

Committee burden-sharing report,<sup>175</sup> included these words:

The message to our allies was clear: we must find the resources, through both battle management and ultimately through funding increases to sustain the common defense and to strengthen our alliances through a progressive evolution of the common defense burden.<sup>176</sup>

Although the burden-sharing debate is essentially political in its makeup; it has gained an impetus of its own leading the European Allies to seek ways to assuage US pressures for tangible "follow-up action on the recommendations agreed"<sup>177</sup> in the NATO Defence Planning Committee's burden-sharing report. Faced with the choice of expending significant additional defence funds or agreeing to enhance resource management of vital logistic stocks at less cost penalty, the pragmatic elders of the Alliance would probably feel constrained to choose the latter.

The concept of pooling or sharing ammunition is not just a method of crisis-managing today's shortfalls although the current levels adds an immediacy to seeking a solution; but is based upon the logic of making the most efficient and effective use of expensive resources in both the short and the longer term. The introduction of management control procedures for Class V supplies would enhance Alliance

cohesion in the Central Region by extending conventional combat duration and limiting the risk of the "Corps on the flanks caving in"<sup>178</sup> through lack of ammunition. It would provide better value for what the nations' taxpayers are 'missing', and most importantly, it would meet the needs of the soldier and his Allied comrades in the field in having ammunition available when in combat.<sup>179</sup>

The proposed solution involves the agreement by nations that all national Corps should hold sufficient Class V supplies for their troops to cover immediate requirements at high intensity with a balance held under NATO's Allied Forces Central Europe command with the control devolved to Army Group level. The required quantities of ammunition involved can be assessed by SHAPE and advised to nations; but as a rule-of-thumb the key would be for national Corps to hold about one-third of the total stockage, with the remainder placed firmly under NATO control.

The suggestion that nations surrender the control of a significant amount of valuable ammunition resources to an Allied command cuts into the very roots of the 'logistics is a national responsibility', ethos. However, such a system would provide four profound advantages:

- First, the combining of a sizeable proportion of Class V supplies under NATO control extends the duration of conventional 'sustainability', even given the same level of today's inadequate stocks. This would be achieved by ensuring that ammunition is allocated to where it is really required - the Corps areas under greatest pressure, and not just spread thinly across the Central Region.
- Second, military control could start to be exercised at the right level, permitting the NATO commander to exert effective command of conventional operations. In truth, the control of logistics cannot be divorced from command; but this situation, alas, exists within NATO today (see Chapter 6).
- Third, the proposal offers a viable political and practical commitment of cooperation and commonly shared responsibilities within the Alliance.
- Fourth, the idea represents the most cost effective solution for the Allies who all face increased national economic pressures highlighted in the burden-sharing debate. Any scheme to trim 'sustainability' costs by

introducing effective logistics management principles cannot be ignored.

The establishment of a NATO ammunition pool in the Central Region, together with a mechanism for control in war would be relatively simple to structure. The Central Europe Pipeline System (CEPS) is a model of successful coalition logistics and its operating principles could be used as an outlined guide. The former Assistant Chief of Staff for Logistics HQ AFCENT described the operational characteristics of the system as follows:

The operating principles of the CEPS can best be likened to an international bank with many branches. The eight user nations can feed in fuel to the pipeline from their own refineries, tankers, or ports and then drain the 'credit' thus established at any other point in the system.<sup>180</sup>

The fuel obviously loses its national identity once placed into the CEPS, but regular checks and balances are undertaken and, in war, control of allocation is coordinated by NATO military staff who ensure that deliveries are made by priority of operational need.

The relationship between linking the control of Class III and Class V supplies was also identified in a study for the Western European Union undertaken by a former Netherlands Military Representative to



NATO's Military Committee. Lieutenant General Dijkstra, a one time Chief of Netherlands Army Logistics and Vice Chief of the Army Staff, drew attention to the successful logistics management of fuel in NATO's Central Region. He felt that:

Is should therefore be possible to follow this principle of international logistic control and international funding to meet another national responsibility for high-priority supply, i.e., ammunition.<sup>181</sup>

The solution for Central Region Allies to delegate a part of their national responsibility for Class V supplies to a NATO organization for control under a 'credit' system in a similar manner to the CEPS, is realistic given the key of 'cooperation'. A major advantage being that the total Central Region stock requirement would be less than the overall combined national goals because enemy pressure could not be sustained against all eight Corps. Apart from the utility of extending conventional 'sustainability', the plan also has economic considerations, a factor recognised by one commentator nearly twenty years ago when ammunition costs were significantly less:

It could indeed be cheaper if the greater flexibility afforded by centrally held, standardized stocks permitted some reduction in overall stock-holding.<sup>182</sup>

The NATO 'pooling' of supplies would also encourage, or perhaps shame, nations into narrowing the gap between promises and deeds. There is some discrepancy in this area as demonstrated by the Allied Defence Ministers regular affirmations to increase annually their countries defence expenditure by 3%.<sup>183</sup> The annual submission of a national reply to NATO's Defence Planning Questionnaire also provides scope for adjustment should a country wish to present a more positive but, maybe slightly inaccurate situation report.

Several disadvantages in establishing a NATO controlled 'pool' of ammunition suggest themselves. First, the Class V stocks would need to be standardized or be 'interchangeable';<sup>184</sup> at present there are some limitations. Second, nations would lose their annual budgetary balancing possibilities first mentioned at the beginning of this Chapter. In addition, a commitment to purchase and pool ammunition stocks under NATO control would provide a verifiable check, which replies to an annual questionnaire, does not give. The following comment by one retired General sets the scene:

However, if deterrence is the major plank in a strategy it is better to economise in the munitions which are stored out of sight than in the equipment is visible on exercises or parades.

There is also no doubt that given the choice, admirals, generals and air marshals will put priority on visible element of their command so that economies tend to all automatically upon weapons rather than platforms.<sup>185</sup>

Third, nations would need greater logistic transport support as stockpiles would tend to be more dislocated. However, the costs of transport in proportion to accrued savings through the pooling of ammunition would represent cents in comparison to dollars, or indeed pennies compared to guineas.<sup>186</sup>

The costs of transport in relation to Class V supplies is an indication of ammunition expense rather cheapness of trucks/personnel, but the role of transport which should remain a 'national responsibility', is fundamental in the 'pooling' of Class V supplies under NATO control. While savings can be made by consolidating resources in many areas of logistic support, especially in a peacetime environment, the "centralizing of transport in a mobile war is losing capability".<sup>187</sup> Combat units in action in Central Europe will have to be tactically flexible and mobile<sup>188</sup> in response to enemy initiatives, and their supplies must also be mobile. A soldier, corporal or general will not fight when he has severe doubts about the logistic support he needs. Mobility and full control 'at the right level' are vital to provide the confi-

dence and will to Allied troops in battle.<sup>189</sup> Given the present level of 'sustainability' in the Central Region, in the final analysis, it is concluded that mobility is more important than the level of stocks. However, logistic mobility is linked to full control, which requires Allied cooperation and leads to demands for enhanced interoperability between nations for logistic stocks and systems.

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#### NOTES - CHAPTER 4

1. NATO Glossary of Terms and Definitions AAP-6 (P) (AAP means Allied Administrative Publication).
2. Martin van Creveld, Supplying War (Cambridge, 1977), p.235 emphasizes that the aim of a military organization is to produce the greatest possible fighting power.
3. Erwin Rommel, Rommel Papers, edited by B.H. Liddell Hart, (London, 1953), p.328.
4. For example: Andrew Hamilton, "Redressing the Conventional Balance", International Security (Summer 1985), pp.111-136. Les Aspin, "Conventional Forces in Europe. Unilateral moves to stability", Bulletin of the Atomic Scientists (December 1987), pp.12-15. Lutz Unterscher, "Conventional Land Forces for Central Europe. A Military Threat Assessment", University of Bradford Peace Research Report No 15 (March 1987). Jonathan Dean, "Military Security in Europe", Foreign Affairs (Full 1987), pp.22-40. Andrew Kelly, "The Myth of Soviet Superiority", University of Bradford Peace Research Report No 14 (March 1987). John J. Mearsheimer, "Numbers, Strategy, and the European Balance", International Security (Spring 1988), pp.174-185. Stephen D. Biddle, "The European conventional balance: A reinterpretation of the debate", Survival (March/April 1988), pp.99-121. Barry R. Posen, "Is NATO Decisively Outnumbered?", International Security (Spring 1988), pp.186-202. Eliot A. Cohen, "Toward Better Net Assessment. Rethinking the European Conventional Balance", International Security (Summer 1988), pp.50-89. Stephen J. Flanagan and Andrew Hamilton, "Arms control and stability in Europe: Reductions are not enough", Survival (September - October 1988), pp.448-463. Stephen J. Cimbala, "Conventional War in Europe: the Unavoidable Nuclear Backdrop", Defense Analysis (Vol 4, 1988), pp.361-376. Richard K. Betts, Heavenly Gains or Earthly Losses? Toward a Balance Sheet for Strategic Defense (Washington, D.C., 1988). "NATO and Warsaw Pact Forces: Conventional War in Europe", The Defense Monitor (Washington, D.C., 1988).
5. See for example, William W Kaufmann, "Who is Conning the Alliance?", The Bookings Review



(Fall 1987), pp.10-17; see also John Borawski, "Toward Conventional Stability in Europe?", The Washington Quarterly, (Autumn 1987), pp.13-29; and Paul K. Davis, "The Role of Uncertainty in Assessing the NATO-Pact Central-Region Balance", RAND Study P-7427 (April 1988), pp.22-24; also Joshua M. Epstein, The 1988 Defense Budget (Washington, D.C., 1987), pp.43-44; and Jonathan Dean, "Alternative defence: answer to NATO's Central Front problems?", International Affairs (Winter 1987/88), p.63.

6. Bernard W Rogers, Wall Street Journal, (5 Jun 1984), p.16.

7. For example in May 1987 Ministers stated:

We recognize that the allocation of sufficient resources to meet our requirements will continue to be a major challenge to all nations. In this respect we reaffirmed the aim of a 3% real increase in defense expenditure as a general guide and the need to obtain the best possible value from the resources made available.

(Defence Planning Committee Communiqué, Ministerial Session in Brussels on 26 and 27 May 1987, NATO Review (June 1987), p.31.)

8. It is a fact that while Defence Ministers of the NATO Alliance regularly agree to the goal of a 3% annual increase in defense expenditure in real terms, the achievement level is such that in 1990 only one nation is likely to meet the target. See note 62 below.

9. A further advance under development (Copperhead II) is a new sensor which, through the use of infra-red detectors identifies a target, say an armoured fighting vehicle, and locks on to the target automatically. In a July 1986 official US publication the cost of Copperhead was shown at \$35,000 per round (Congress of United States, Office of Technology Assessment Special Report "Technologies for NATO's Follow-on Forces Attack Concept" (Washington, D.C.), p.27) - the complete document provides an interesting background. See also Frederick A. Tarantino, "A Substitute for NATO's Nuclear Option?", Military Review (March 1988), pp.25-35 for a professional view. For a laymans

guide to ammunition advances see Neville H. Cross "The Lethal Solution: Ammunition Developments", Defense Communications Security Review (28/1989), pp.6-10.

10. These costs are based upon 1988 UK Ministry of Defence prices supplied to the author on 20 September 1988 and comprise an appropriate mix of HE (high explosive), smoke and illuminating 155 mm ammunition for the FH70 variant.
11. See Anthony H. Cordesman, NATO's Central Region Forces (London, 1988), p.123; see also K.A.P. Stevenson, "Praise the Lord and Pass the Ammunition", Royal Artillery Journal (September 1984) pp.95-104 who records that UK daily ammunition expenditure rates for M109 had been trebled following a review.
12. During NATO's earlier 'trip-wire' strategy with emphasis placed on nuclear deterrents the incentive to stockpile significant quantities of conventional ammunition was lacking; see Henry A. Kissinger, Nuclear Weapons and Foreign Policy (London, 1957), p.242., and Lawrence S. Kaplan, NATO and the United States (Boston, Mass, 1988), p.170. The change to flexible response in 1967 should have stimulated the Allies to do more; however these comments made 20 years ago some two years after the adoption of the then new, but still current, NATO strategy are noteworthy:

Today, some of the NATO Allies have only a few days' or weeks' supplies for their forces on hand. They justify this by saying that, since their forces are so greatly outnumbered, a conventional defense could only last a few days. Of course, if they only buy a few days' worth of ammunition, they can be sure their forces will not be able to fight longer.

(Alain C. Enthoven, "Arms and Men: The Balance in Europe", Military Review (September 1969), p.81).

13. The Treaty came into force on 24 August 1949 after the déposition of the ratification of all signatory states. (NATO Handbook (Brussels, 1986), p.13). The original twelve signatories were joined by Greece and Turkey in 1951, the Federal Republic of Germany in 1955 and Spain in 1982 therefore now sixteen nations.
14. See C.J. Dijkstra, "Collective logistical support", Western European Union Document 966 (Paris, 1983), p.5; see also David A.R. Cooper, "Towards Armaments Planning at NATO", Canadian Defence Quarterly (Summer 1988), p.38 for comments on surplus amounts of Second World War equipment in Europe when NATO was formed.
15. The emphasis placed upon military structure building "never before attempted on such a large scale" is also noted by C.J. Dijkstra, *Ibid*; p.5. See also NATO Facts and Figures (Brussels, 1984), pp.25-26.
16. To quote from the then Secretary General's opening address to the first Senior NATO logisticians Conference:

When NATO was first created, care was taken to make it an international, not a supranational organization. Although a uniformed command structure was established for operational purposes, no centralised logistic support system was introduced.

(Joseph M. Luns address to the SNLC July 1976, NATO document AC/305-DS/1 Annex I, p.1).
17. The full guidance is "Logistics is a national responsibility in peace and in war". See James A. Huston, One for All (Newark, Delaware, 1984), p.290 note 31.
18. These are the first two sentences from the North Atlantic Council Resolution of 23 February 1952. NATO Document MC 36/2 (Revised) of 18 May 1960 also notes that the provision of logistic resources

to meet NATO operational plans is a national responsibility.

19. The NATO definition of Co-ordinating Authority is:

The authority granted to a commander or individual assigned responsibility for coordinating specific functions or activities involving forces of two or more countries, or two or more services or two or more forces from the same Service. He has the authority to require consultation between the agencies involved or their representatives, but does not have the authority to compel agreement. In case of disagreement between the agencies involved, he should attempt to obtain essential agreement by discussion. In the event he is unable to obtain essential agreement, he shall refer the matter to the appointing authority.

(NATO Glossary of Terms and Definitions AAP-6 (P)).

20. For additional background see NATO Logistics Handbook (Brussels, 1989), p.26.
21. NATO Document MC 55/1. See also James A. Huston, One for All (Newark, Delaware, 1984) pp.291-292.
22. David C. Isby, "The United Kingdom", in Jeffrey Simon, ed., NATO-Warsaw Pact Force Mobilization (Washington, D.C., 1988) pp.326-327. See also Thomas A. Callaghan, Jr, "The Structural Disarmament of the West: Our Most Critical Defense Industrial Challenge", in Lee D. Olvey, Henry A. Leonard, Bruce E. Arlinghaus, eds., Industrial Capacity and Defense Planning (Lexington, 1983), pp.15-17.
23. Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, North Atlantic Assembly Paper Conventional Defence in Europe (Brussels, 1985), p.4. See also Newt L. Gingrich and Albert S. Hanser, "Alternate Strategies for the Defense of Western Europe" in Terry L. Hayns, ed., Understanding US Strategy: A Reader (Washington, D.C., 1983), pp.175-179.
24. Known by its NATO Military Committee designation



of MC 14/2. Karsten Voigt, North Atlantic Assembly Paper Conventional Defence in Europe (Brussels, 1985), p.4. See also Phillip A. Karber and John H. Millam, "The Federal Republic of Germany" in Jeffrey Simon, ed., NATO-Warsaw Pact Force Mobilization (Washington, D.C., 1988), p.248; and Robert A. Levine, "NATO, the Subjective Alliance", RAND Paper (1988), pp.22-24.

25. The ACE Sword Shield is a good emblem:

Allied Command Europe's (ACE) sword and shield symbol was taken to represent the conventional shield and nuclear sword of NATO defense.



(Karsten Voigt, North Atlantic Assembly Paper, Conventional Defence in Europe, (Brussels, 1985), p.4).

See also James A. Huston, One for All (Newark, Delaware, 1984), pp.89-90.

26. Known by its NATO Military Committee designation of MC 14/3. NATO Logistics Handbook (Brussels, 1989), p.107.
27. NATO Handbook (Brussels, 1986), p.27.
28. Bernard W. Rogers, "NATO's Strategy: An Undervalued Currency", Adelphi Paper 205 (London, 1986), p.6.
29. Military Planning Factors MC 55/2 (Final) dated 5 April 1973. The originally classified 30 day goal for ammunition stocks has now been reported in a number of publications. For example; UK's Chief of Defence Staff in evidence to the House of Commons Defence Committee mentioned "the NATO 30 day ammunition scales" (Third Report from the Defense Committee, Session 1984-85, ordered by The House of Commons to be published on 23 May 1985, p.210). Also NATO's Director of Logistics in interview (Jacob Goodwin, "Smith: Is anybody Listening?", Military Logistics Forum (September 1985), p.44). UK's Secretary of State for Defence in evidence to the House of Commons Defence Committee (Second Report from the Defence Committee, Session 1985-86, ordered by The House of Commons to be printed on 5 June 1986, p.17). SACEUR in an on-the-record interview with David Bucham, Financial Times, 24 February 1987. Senator Sam Nunn in interview with Peter Jenkins, The Independent, 16 February 1988,



p.17. A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles Risks and Responsibilities in the Alliance, (Brussels, 1988), p.62.

30. See James R. Golden, "NATO Industrial Preparedness", in Lee D. Olvey, et al, eds., Industrial Capacity and Defense Planning (Lexington, 1983), pp.54-55. The following comment by UK's Assistant Chief of the Defence Staff (Logistics) is also relevant:

Despite NATO guidance requiring national stockpiles of 30 days of supply and a percentage of reserve equipments, collectively Alliance stockholdings are dangerously short of these levels...

(Paper by Major General I. S. Baxter "Sustainability - A concept which may come of age" presented to the Kings College London/MOD Conference "Britain and the Central Region - 18/19 July 1989".)

31. NATO Standardization Agreement 2961 (STANAG 2961).
32. C.J. Dijkstra, "Collective logistical support", Western European Union Document 966 (Paris, 1983), p.8.
33. The full reference is:  
SHAPE Guidance for Stockpile Planning in ACE (1220.16/NS004/SHLODA/82 of 31 March 1982).
34. Military Planning Factors MC55/2 (Final) dated 5 April 1973, Appendix B.
35. STANAG 2115. It is intriguing to note that the Soviet Army uses almost exactly the same method/basic norm (normy raskhda) for consumption of fuel; see C.N. Donnelly, "Soviet use of Military History for Operational Analysis: Establishing the Parameters of the concept of Force Sustainability", Soviet Studies Research Centre, RMA Sandhurst precis No C58 (October 1986), p.25.
36. Field Marshal Sir Edwin Bramall in evidence to the Defence Committee, Session 1984-85 ordered by The House of Commons to be published on 6 February 1985, p.210.

37. NATO Logistics Handbook (Brussels, 1989), pp.81-82.
38. John Keegan, Daily Telegraph, 13 May 1986.
39. Major General Homer D. Smith, Jr, Director of Logistics, interviewed by the author at NATO Headquarters, Brussels 21 January 1987.
40. See Steve Connor, "Challenging times for paper tanks", New Scientist (7 January 1989), pp.28-29. See also George F. Will, "Europe: Beware The Iron Fists in Gloves of Velvet", International Herald Tribune (3-4 December 1988), p.4.
41. SHAPE Guidance for Stockpile Planning in ACE (1220.16/NS004/SHLODA/82 of 31 March 1982).
42. MC 55/2 (Final) dated 5 April 1973, Appendix B.
43. See: Report of the European Security Study (ESECS), Strengthening Conventional Deterrence in Europe (London, 1983), p.170. Jacob Goodwin, "Smith: Is anybody listening?", Military Logistics Forum (September 1985), p.44. Bernard W. Rogers, "NATO's Conventional Defence Improvement Initiative", NATO's Sixteen Nations (Jul 1986), p.19. Leonard Sullivan, Jr, and Thomas H. Etzold, "Security and Stability in Conventional Forces: Differing Perceptions of the Balance", consultation draft occasional paper The Atlantic Council of the United States (Washington, D.C., 1988), pp.44-45. Special Report of the North Atlantic Assembly, NATO in the 1990's (Brussels, 1988), p.30. John Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), p.23. Laurence Martin, "NATO after the INF Treaty", paper presented to Brassey's Seminar for Industry on 8 December 1988 in London.
44. General Wolfgang Altenburg, Chairman of NATO's Military Committee is quoted by Elizabeth Pond, "NATO sees need to beef up Forces", The Christian Science Monitor (28 May 1987), p.9. See also Fred C. Iklé and Albert Wohlstetter, co-chairman of the Report of the Commission on Integrated Long-Term Strategy, Discriminate Deterrence (Washington, D.C., 1988), p.27.

45. Some NATO pundits affirm that this provision is designed to allow the Allies to re-group by the sea once the ammunition runs out.
46. Petroleum Times, Business Review (July 1988), p.19.
47. Claude M. Kicklighter, "The Central Europe Pipeline System", NATO's Fifteen Nations (Special 2/1981), p.86.
48. Homer D. Smith and David A. Simpson, "The NATO Pipeline System", Army Logistician (January - February 1985), p.18.
49. NATO's Director of Logistics is quoted:  
  

We need to double the storage capacity and double the throughput capacity of our pipeline system. We've got to be able to move twice as much fuel through the system in the same length of time as we do now.

(Jacob Goodwin, "Smith: Is Anybody Listening?", Military Logistics Forum (September 1985), p.48.)
50. Goal agreed by the NATO Pipeline Committee in May 1987 and recorded in NATO Document AC/112-D/213. See also: Paul Jackson, "Fuelling Speculation", Armed Forces (February 1988), pp.61-63. Larry Grossman, "Army wants single fuel in NATO pipeline", Military Forum (January/February 1989), p.8. A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.27.
51. David A. Simpson International Staff Logistics Directorate interviewed by the author at NATO Headquarters Brussels, 16 March 1989. See also F. Durst, R Haas and W. Interthal, "Laminar and turbulent flows of dilute polymer solutions: a physical model", Rheologica Acta, Vol. 21. No4/5 (1982), pp.572-577.
52. Conoco CDR 102 Flow Improver information sheet provided by ConocoSpeciality Products Inc, Houston, Texas.

53. See Richard J. Mannheimer, "Rheological and Mist Ignition Properties of Dilute Polymer Solutions", Chemical Engineering Communications Vol. 19 (1983), pp.221-241.
54. NATO's Director of Logistics stated:

Across the board, nations have pretty well brought their fuel supplies up to the requisite levels. The problem with fuel is its distribution.

(Jacob Goodwin, "Smith: Is Anybody Listening?", Military Logistics Forum (September 1985), p.46).
55. See Christopher Coker, "Discriminate Deterrence and the Alliance", Strategic Review (Spring 1988), pp.53-54; also, Michael Moodie and Brent Fischmann, "An action plan for NATO", NATO Review (February 1988), p.21; also, Special Report of the North Atlantic Assembly, NATO in the 1990's (Brussels, 1988), p.13 and p.30; also, A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.27 and p.76. See also the comment by Major General Baxter at note 30 above.
56. L James Binder, "Gen. Rogers: Time to Say 'Time Out'", Army (September 1987), p.34.
57. John Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), p.23.
58. See David C. Isby, "The United Kingdom" in Jeffrey Simon, ed., NATO - Warsaw Pact Force Mobilization (Washington, D.C., 1988), p.326; also, James R. Golden, "NATO Industrial Preparedness", in Lee D. Olvey, Henry A. Leonard, Bruce E. Arlinghaus, eds., Industrial Capacity and Defense Planning (Lexington, 1983), pp.51-56.
59. See Thomas A. Callaghan, Jr, "NATO Still in the Throes of Structural Disarmament", Armed Forces Journal International (December 1988), pp.61-62.



60. See the official Communiqué of NATO's Defence Planning Committee following its meeting in Ministerial Session in Brussels on 4 and 5 December 1984, paragraph 7; also, a Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.27.
61. The Concise Oxford Dictionary.
62. NATO Defence Ministers have ritually agreed to a 3% increase in defence spending every year since 1977 including the most recent meeting in Brussels on 8 and 9 June 1989. See the Defence Planning Committee Communiqué issued by NATO's Information Service Brussels and especially the Resource Guidance. See also Adela Gooch in the Daily Telegraph, 9 June 1989, p.17 and Frederick Bonnard in The Times, 10 June 1989, p.9. The wry comment by Lord Carrington as NATO's Secretary General following the 1987 reaffirmation of the 3% goal reported by David Usborne in The Independent on 28 May 1987 is still very appropriate "Defence Ministers don't carry cheque books". For a more political slant see Minutes of Evidence taken before the House of Commons Defence Committee on 19 December 1984; Third Report from the Defence Committee Session 1984/85, ordered by The House of Commons to be printed 23 May 1985, Volume 2, pp.35-37.
63. See Lawrence J. Korb, "A New Look at US Defense Industrial Preparedness", in Lee D. Olvey, Henry A. Leonard, Bruce E. Arlinghaus, eds., Industrial Capacity and Defense Planning (Lexington, 1983), p.28. For a general background, the evidence taken in private on 14 May 1986 by the House of Commons Defence Committee included the following exchange with the Rt Hon George Younger, Secretary of State for Defence (on war stocks):

We may be doing better in Great Britain than some of our NATO allies, but NATO as a whole is not doing very well and this question of standards needs to be addressed. Do you agree with that?  
(Mr Younger) I do agree with that.

(Second Report from the Defence Committee, Session 1985-86, ordered by The House of Commons to be printed on 5 June 1986, p.21.)



64. DPQ; see NATO Logistics Handbook (Brussels, 1989), p.97; also the report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security Shared Role, Risks and Responsibilities in the Alliance (Brussels, 1988), p.27; also Lawrence Korb, "Measuring US Contributions to NATO Defense", in Stanley R. Sloan, ed., NATO in the 1990's (Washington, D.C., 1989), p.194.
65. NATO Facts and Figures (Brussels, 1984), p.199.
66. See NATO Logistics Handbook (Brussels, 1989), p.63.
67. The undue reliance placed upon Warsaw Pact explosive fillers was discussed with Lord Carrington, Secretary General to NATO, interviewed by the author at NATO Headquarters, Brussels on 1 February 1988.
68. The 1989 NATO definition of sustainability is:  
The ability of a force to maintain the necessary level of combat power for the duration required to achieve its objectives.  
  
(NATO Glossary of Terms and Definitions. AAP-6 (P)).
69. C.N. Donnelly et al., in consultant report for the SHAPE Technical Centre "The Sustainability of the Soviet Army in Battle", Soviet Studies Research Centre, RMA Sandhurst Precis No C53 (September 1986).
70. Voyemnyy Entsiklopedicheskiy Slovar, (Moscow Military Publishing House, 1983), p.256.
71. V.G. Reznichenko et al., Taktika, (Moscow Military Publishing House, 1984), pp.66-67
72. C.N. Donnelly et al., "The Sustainability of the Soviet Army in Battle", p.37.
73. For comparison of NATO-Warsaw Pact conventional strengths, a dynamic situation, see NATO publication Conventional Forces in Europe: The Facts (Brussels 1988); for comment on this document see John H. Milam and Diego A. Ruiz Palmer, "'Conventional Forces in Europe' What's in the Graphs?", Armed Forces Journal International (January 1989), p.47 and p.52. See also UK's Statement on the Defence Estimates 1989 (London, 1989), Volume 1.

74. C.N. Donnelly et al., "The Sustainability of the Soviet Army in Battle", p.233.
75. See David C. Isby, "The United Kingdom" in Jeffrey Simon, ed., NATO-Warsaw Pact Force Mobilization (Washington, D.C., 1988), pp.326-327.
76. C.N. Donnelly et al., "The Sustainability of the Soviet Army in Battle", p.233. See also the exchange between Mr Churchill and the Rt Hon George Younger when the Secretary of State was giving evidence to the House of Commons Defence Committee on the 14 May 1986; Second Report from the Defence Committee, Session 1985-86, ordered by The House of Commons to be printed on 5 June 1986, p.18.
77. See George T. Norris, "Bite the Bullet: Looking at Red CSS", Field Artillery Journal (March - April 1986), pp.24-25; also, US Secretary of Defense publication Soviet Military Power: An Assessment of the Threat 1988 (Washington, D.C., 1988), p.91.
78. See US Secretary of Defense publications; Soviet Military Power 1986 (Washington, D.C., 1986), pp.100-101; Soviet Military Power 1987 (Washington, D.C., 1987), pp.101; also, the Third Report from the Defense Committee, Session 1984-85 ordered by The House of Commons to be printed 23 May 1985, Volume III, p.10; also see John Hemsley, "The Influence of Technology upon Soviet Operational Doctrine", RUSI Journal (June 1986), pp.26-27; and Graham H. Turbville, Jr., "Sustaining Theater Strategic Operations", The Journal of Soviet Military Studies (April 1988), p.87.
79. UK Statement on the Defence Estimates 1989 (London 1989), Volume I, Cm 675-1, p.45.
80. Ibid, p.45; see also J.B.A. Bailey, Field Artillery and Firepower (Oxford, 1989), p.27.
81. UK Statement on the Defence Estimates 1989 (London 1989), Volume 2, Cm 675-II, p.19.
82. Ibid, p.11.

83. Minutes of Evidence taken before the Defence Committee, Third Report, Session 1984-85, ordered by The House of Commons to be printed 23 May 1985, Volume III, p.62; also, Minutes of Evidence taken before the Defence Committee, Second Report, Session 1985-86, ordered by The House of Commons to be printed 5 June 1986, p.18.
84. Arnulf Baring, "Transatlantic relations: The view from Europe", NATO Review (February 1989), p.20.
85. UK's Statement on the Defence Estimates 1989 (London, 1989), Volume I, p.45).
86. See Mark Urban, The Independent (4 April 1989), p.19; also, Adela Gooch, The Daily Telegraph (19 May 1989), p.10.
87. The use of historical experience and quantitative methods is covered in depth by Ivan Makarovich Golushko and Nikolay Viktorovich Varlamov, Osnovy Modelirovaniya I Avtomatizatsii Upravleniya Tylom (Moscow, 1982), pp.1-238. A translation of the title means Principles of Simulating and Automating Rear Services Control and it is significant that both authors are General officers in the Soviet Forces with Colonel General Golushko serving for the last 10 years as Chief of the Rear Services Staff. For background on the application of 'dialectical materialism' and its contribution to Soviet Military Theory see B. Byely et al., Marxism - Leninism on War and Army (Moscow, 1972), pp.292-300.
88. Peter G. Moore, Reason by Numbers (Bungay, Suffolk, 1980), p.24.
89. C.N. Donnelly et al; "The Sustainability of the Soviet Army in Battle"; p.416.
90. From 1986 to 1989 when the present shorter version was adopted, the initial SHAPE proposed definition for 'Sustainability' was;

The ability of NATO forces to maintain the necessary level and duration of combat activity to achieve their objectives. This requires sufficient personnel, equipment and stocks on hand and also the ability to re-supply and re-inforce on a continuous basis.

Sustainability is normally expressed in days, but also reflects the Commander's subjective assessment of the overall capabilities of his command to sustain military operations.

(NATO Logistics Handbook (Brussels, 1986), p.151.)

91. The making of competent decisions does however rely upon the correctness of information received from the national agencies involved. Discussed with Colonel Richard A. Orsini, Chief of Logistic Plans and Policy at SHAPE (Mons) on 14 May 1987; author's notes.
92. North Atlantic Council Resolution of 23 February 1952.
93. For comment on Britain's industrial decline see Paul Kennedy, The rise and fall of the great powers: economic change and military conflict (London, 1988), p.480; also, David C. Isby, "The United Kingdom", in Jeffrey Simon, ed., NATO-Warsaw Pact Force Mobilization (Washington, D.C., 1988), p.326.
94. Defined in this context as:

...covering this nations' responsibilities for the continuous support of their forces giving consideration to all foreseeable war-time contingencies. Re-supply arrangements could comprise a wide variety of measures, ranging from additional stockpiling to stand by procurement or production.

(Military Planning Factors, MC 55/2 (Final) dated 5 April 1973, Appendix B).

95. Bernard W Rogers, Wall Street Journal, 5 June 1984, p.16.
96. SHAPE Guidance for Stockpile Planning in ACE (1220.16/NS004/SHLODA/82 of 31 March 1982).
97. See Trevor Taylor, Defence, Technology and International Integration (London, 1982), p.162.



98. K.A.P. Stevenson, "Praise the Lord and pass the ammunition", Royal Artillery Journal (September 1984), p.95. See also M.A. Gilbertson, "Development of Logistics in the British Army" in J.J.G. MacKenzie and Brian Holden Reid, eds., The British Army and the operational level of war (London, 1989), p.78.
99. Minutes of Evidence taken on 14 May 1986, Second Report from the Defence Committee Session 1985-86, ordered by The House of Commons to be printed on 5 June 1986, p.19.
100. Ibid, p.20; see also David M. Shilling, "Europe's Conventional Defence: Solid Progress but Challenges Remain", Survival (March/April 1988), p.124.
101. Anthony H. Cordesman, NATO's Central Region Forces (London, 1988), p.123.
102. Ibid, p.147.
103. Minutes of Evidence taken in private on 14 May 1986, Second Report from the Defence Committee Session 1985-86, ordered by The House of Commons to be printed on 5 June 1986, p.21.
104. For the 'approved scenario' in 1984 see J.B.A. Bailey, Field Artillery and Firepower (Oxford, 1989), Appendix A. The costs are based upon UK Ministry of Defence prices supplied to the author 1988.
105. A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.27.
106. See Willy Gontier, "Belgium", NATO's Fifteen Nations (Special 2/1981), p.47.
107. Alton G. Keel, Jr., "Defence Cooperation in NATO's Fifth Decade", NATO's Sixteen Nations (December 1988 - January 1989), p.17.
108. See Russell Watson, John Barry, Margaret Garrard Warner and Robert B. Cullen, "The High Cost of NATO 'Burden-Sharing' becomes a hot US political issue", Newsweek (7 March 1988), pp.16-17; see also Frank Carlucci interviewed by Peter Jenkins, "Europe's fears addressed", The Independent (14 March 1988), p.21; also see Clyde Haberman, "Allies Must Share Greater Burden of Defense, Pentagon Official Says",



- International Herald Tribune (12 October 1988), p.6; see also Hella Pick, "A testing time for Europe", The Guardian (25 November 1988), p.25.
109. Colonel Jan Schouten, formerly Assistant Chief of Staff for Logistics, NATO's Northern Army Group. Interviewed by the author in Deventer The Netherlands, 15 March 1989.
  110. Maarten Engwerda, General Rapporteur Economic Committee in North Atlantic Assembly Report, General Report on The Economics of Atlantic Security (Brussels, 1987), p.3.
  111. See Inger-Lise Skarstein, Rapporteur Sub-Committee on Public Information on Defence and Security in North Atlantic Assembly Report, Norway, The United States, The Federal Republic of Germany and Denmark (Brussels, 1988), p.35.
  112. Russell Watson, John Barry, Margaret Garrard Warner and Robert B. Cullen, "The High Cost of NATO 'Burden-Sharing' becomes a hot US political issue", Newsweek (7 March 1988), p.16.
  113. Dexter Jerome Smith in exclusive interview with The Hon William Taft IV, "The Issue that Just Won't Go Away", Defence (November 1988), p.383; see also the editorial comment of the Financial Times (7 October 1988), p.22.
  114. See José Lello, Rapporteur Sub-Committee on Defence Cooperation of the Defence and Security Committee in North Atlantic Assembly Report Burden-Sharing in the Alliance (Brussels, 1988), p.1; see also, NATO Diary in NATO's Sixteen Nations (April/May 1988), p.79.
  115. NATO's Defence Planning Committee Communiqué issued following the meeting at Ministerial Session in Brussels on 1 and 2 December 1988 and reproduced in NATO Review (December 1988), pp.26-28.
  116. A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988). See Joseph Fitchett "NATO Ministers Urge European Efforts", International Herald Tribune (2 December 1988), p.2 who notes that "the report was intended, NATO officials said, to counter pressure in Congress..."; see also Richard Halloran's comment about the "diplomatically worded report" in International Herald Tribune (30 December 1988), p.2.

117. Report of the Defense Burdensharing Panel of the Committee on Armed Services, House of Representatives (Washington, D.C., 1988).
118. Ibid; see also Richard Halloran, "Allies Warned on Troop Aid", International Herald Tribune (8 August 1988), p.3.
119. Joseph Fitchett, "NATO Ministers Urge European Efforts", International Herald Tribune (2 December 1988), p.2.
120. See Simon Lunn, "Burden-Sharing in NATO", Chatham House Paper 18 (London, 1983), pp.1-4. Michael Legge, "Burden-Sharing. The View from London...", The National Interest (Summer 1988), p.34. Alton G. Keel, Jr., "Sharing the collective defence burden. US debate must not be ignored", NATO Review (October 1988), p.4. Brian Field, "Economic theory, burden-sharing and the NATO Alliance", NATO Review (December 1988), p.11. James B. Steinberg, "European Defence Cooperation: Why Now?", in Jonathan Alford and Kenneth Hunt, eds., Europe in the Western Alliance: towards a European defence entity? (London, 1988), p.46.
121. Report of the Secretary of Defense Caspar W. Weinberger to the Congress on the FY 1986 Budget, FY 1987 Authorization Request and FY 1986-90 Defense Programs dated 4 February 1985, p.228.
122. Report by Secretary of Defense Caspar W. Weinberger to the United States Congress on Allied Contributions to the Common Defense dated April 1987, p.11.
123. See for example; Gavin Kennedy, Burden-Sharing in NATO (London, 1979); also, Gavin Kennedy, Defense Economics (London, 1983), pp.24-70. Simon Lunn, "Burden-Sharing in NATO", Chatham House Paper 18 (London, 1983). M.K.J. Rode, "Burden-Sharing in the North Atlantic Alliance", Seaford House Paper (London, 1986). Staff Working Paper Alliance Burdensharing: A Review of the Data by the United States Congressional Budget Office dated June 1987. José Lello, Rapporteur Sub-Committee on Defence Cooperation of the Defence and Security Committee in North Atlantic Assembly Report Burden-Sharing in the Alliance (Brussels, 1988). Report by Secretary of Defense Frank C. Carlucci to the United States Congress on Allied Contributions to the Common Defense dated April 1988. Report by NATO's Defence Planning

Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988). David Greenwood, "Defense Burdensharing: European and Canadian Contributions to NATO's Defenses", in Stanley R. Sloan, ed., NATO in the 1990's (Washington, D.C., 1989), pp.175-191.

124. The proportion of US Defence Budget is not open to precise measurement, but the Department of Defense suggests that about 60% of its budget is spent on forces directly committed to NATO; see US Congressional Budget Office Staff Working Paper Alliance Burdensharing: A Review of the Data, June 1987, p.13. A figure of 55% which includes early and late reinforcements and a proportion of strategic forces is given by Phil Williams, "American troops in Europe: a great new debate?", World Today (December 1987), pp.215-218. Approximately "half of the American Defense budget" is quoted by David P. Calleo, Harold van B. Cleveland and Leonard Silk in "The Dollar and the Defense of the West", Foreign Affairs (Spring 1988), p.858. The Financial Times reports that while the US spends \$100 bn a year on defending Europe, some calculations of overall NATO commitments place the figure as much as \$170 bn annually, some 60% of its defence budget; see David White, "Squabbling over how to share the burden", Financial Times (25 November 1988), p.12. A comprehensive analysis by Lawrence Korb plumps for between 40% and 60%, but concludes that a US withdrawal from Europe would not provide proportionate savings, see Lawrence Korb, "Measuring US contributions to NATO Defense" in Stanley R. Sloan, ed., NATO in the 1990's (Washington, D.C., 1989) pp.193-208.
125. See Maarten Engwerda, General Rapporteur of the Economic Committee in North Atlantic Assembly Report The Economics of Atlantic Security (Brussels, 1987), pp.30-31; also, Michael Legge, "Burden-Sharing: The view from London", The National Interest (Summer 1988), pp.34-42; also, José Lello, Rapporteur Sub-Committee on Defence Cooperation of the Defence and Security Committee in North Atlantic Assembly Report Burden-Sharing in the Alliance (Brussels, 1988); and the Report by NATO's Defence Planning Committee Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), pp.19-72; also NATO's Eurogroup booklet

Western Defense: The European Role in NATO (Brussels, 1988), whose bar-charts on p.18 reinforces the old addage of 'statistics and lies'.

126. See James Schlesinger, "Preserving the American Commitment", NATO Review (February 1989), pp.13-17.
127. Alton G. Keel, Jr., "Defence Cooperation in NATO's Fifth Decade", NATO's Sixteen Nations (December 1988 - January 1989), p.17.
128. Fred C. Iklé and Albert Wohlstetter, Co-Chairman; Report of The Commission on Integrated Long-Term Strategy Discriminate Deterrence (Washington, D.C., 1988), p.5. The theme is also taken up by two former US Secretaries of State:

Since 1941, successive generations of Americans have accepted the global responsibilities thrust on the United States.

(Henry Kissinger and Cyrus Vance, "Bipartisan Objectives for American Foreign Policy", Foreign Affairs (Summer 1988), p.900).

129. See Donald E. Nuechterlein, "National Interests and National Strategy: The Need for Priority" in Terry L. Heyns, ed., Understanding US Strategy: A Reader (Washington, D.C., 1983), pp.35-63.
130. Ibid, p.61. For a US military global overview see the Report prepared by the US Joint Staff, United States Military Posture for FY 1989 (Washington, D.C., 1988) pp.17-38.
131. Robert E. Hunter, "Will the United States remain a European Power?", Survival (May 1988), p.218.
132. Martin Edmonds, "European Approaches to NATO 'Quot Homines, Tot Sententiae'", in Linda P. Brady and Joyce P. Kaufman, eds., NATO in the 1980's: Challenges and Responses (New York, 1985), p.99.
133. See Phil Williams, "American troops in Europe: a new great debate", World Today (December 1987), pp.215-218. The perception that the European Allies may be more reliant upon Gulf Oil than the US (Iklé and Wohlstetter report Discriminate Deterrence, p.66) is not born out in the US Report "Western Vulner-



ability to a Disruption of Persian Gulf Oil Supplies: US Interests and Options", Report 83-24F by the US Congressional Research Service in 1983; which analysed that a short term disruption in supplies would have approximately the same economic impact for the US as for Europe and Japan.

134. Stanley R. Sloan, NATO's Future: towards a new transatlantic bargain (London, 1986), p.149. Interestingly the almost identical sentence appears in the Special Report of the North Atlantic Assembly Committee NATO in the 1990's (Brussels, 1988), p.33, for which Stanley Sloan was Study Director.
135. Geoffrey Lee Williams and Alan Lee Williams, The European Defence Initiative (London, 1986), p.46.
136. Martin Edmonds, "European Approaches to NATO: 'Quot Homines, Tot Sententiae'", in Linda P. Brady and Joyce P. Kaufman, eds., NATO in the 1980's: Challenges and Responses (New York, 1985), p.113.
137. See Fred C. Iklé and Albert Wohlstetter, Co-Chairman; Report of the Commission on Integrated Long-Term Strategy, Discriminate Deterrence (Washington, D.C., 1988), p.66.
138. Indeed the British view of foreign policy positively deters NATO Allies involvement in UK and Commonwealth matters as for example; in Hong Kong, Gibraltar and the Falkland Islands. The same lack of enthusiasm for Allied activity in foreign policy extends to other areas of UK interest, for example; South Africa. This preference to keep foreign affairs a 'national responsibility' has permiated to the other European Allies often to the chagrin of the US who feel that they have earned the right to lead. It has been noted that:

The United States are far more preoccupied with the Soviet threat in the Third World than are the European allies, who tend to see Third World threats to Western security originating from within those countries and regions. The United States also tends to respond to Third World challenges with military instruments of national



power while the European allies are inclined to respond with their principle assets - economic and diplomatic tools of statecraft.

(Stanley R. Sloan, NATO's Future: towards a new transatlantic bargain (London, 1986), p.150).

139. See Desmond Crowley, The Background to Current Affairs (London, 1970), pp.160-164; see also, François Heisbourg, "The three ages of NATO strategy", NATO Review (February 1989), pp.24-29.
140. See Stanley R. Sloan, NATO's Future: towards a new transatlantic bargain, (London, 1986), p.39.
141. Henry A. Kissinger, Nuclear Weapons and Foreign Policy (London, 1957), p.272.
142. NATO Facts and Figures (Brussels, 1984), p.340.
143. See Geoffrey Lee Williams and Alan Lee Williams, The European Defence Initiative: Europe's Bid for Equality (London, 1986), p.46; see also Henry A. Kissinger, "A Plan to Reshape NATO", Time (5 March 1984), pp.14-18.
144. See Newt L. Gingrich and Albert S. Hanser, "Alternative Strategies for the Defense of Western Europe" in Terry L. Heyns, ed., Understanding US Strategy: A Reader (Washington, D.C., 1983), p.177; see also, Lawrence S. Kaplan, NATO and The United States: The Enduring Alliance (Boston, Mass, 1988), p.171; see also Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, in North Atlantic Assembly Report Conventional Defence in Europe (Brussels, 1985), p.5.
145. NATO Triad; see Chapter 1 or NATO Handbook 1986 (Brussels, 1986), p.27.
146. Stanley R. Sloan, NATO's Future: towards a new transatlantic bargain (London, 1986), pp.42-43. It must be noted that the US/Soviet Union INF Agreements of 1987 and 1988 did not involve much Allied Consultations when even the US SACEUR was caught wrong footed; see L. James Binder, "Gen Rogers: Time to say 'Time Out'", Army (September 1987), pp.23-24.

147. See a Report by the Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988).
148. See Paul Webster, "France slashes defence budget", The Guardian (25 May 1989), p.8. Lord Carrington as Secretary General of NATO made an earlier plea "Don't cut defence to pay for schools", see Michael Evans, "Carrington in arms warning", The Times (6 October 1987), p.4.
149. The 'political' report states:
- Brent Snowcroft, named to head the US National Security Council, has said that a bigger allied military contribution, offering economies for the US defense budget will be his main priority for the initial months after he assumes office in January.
- (Joseph Fitchett, "US Is Putting the Arm on Allies to Spend More on Their Own Defense), International Herald Tribune (1 December 1988), p.1).
150. US Defence spending is scheduled for zero growth in 1990 with a 1% increase in 1991 and 2% increase in 1992; see Lionel Barber, "Cheney outlines defence cuts", Financial Times (26 April 1989), p.8; see also NATO's Defence Planning Committee Communiqué following the Ministerial session on 8 and 9 June 1989, in particular the Resource Guidance concerning the retention of the 3% annual real increase in defence expenditure target.
151. A Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.iv.
152. The word 'agreed' in respect of stock-levels has been used in preference to the word 'adequate' which features in the DPC Report "Enhancing Alliance Collective Security" (note 151 above). There is a significant difference between what is adequate and what has been agreed as an 'interim' goal.

153. See David M. Abshire, "NATO's Conventional Defence: The Need for a Resources Strategy", NATO Review (October 1984), pp.8-13; see also David M. Abshire, "A Resources Strategy for NATO", NATO's Sixteen Nations (October 1985), pp.66-63, 65-66, 68-69. In a lecture to the Royal United Services Institute in London on 5 November 1987 Dr. Abshire declared that "a resources strategy has got to come" and, with regard to conventional improvements "think smarter, not richer". (Author's notes). See also Ron Acuff, "Making Better Use of Resources", Army Logistician (July - August 1988), pp.27-29; see also, David Greenwood, "Making better use of resources in NATO", Defence Minister and Chief of Staff (No2/1988), pp.5-8; also, David M. Abshire and Michael Moodie, "NATO Armaments Cooperation - An Action Plan for the Future", NATO's Sixteen Nations (December 1987 - January 1988), pp.12-15.
154. NATO Logistics Handbook (Brussels, 1989), pp.147 and 151).
155. See for example; Thomas A. Callaghan, Jr's., report prepared for the US Department of Defense Pooling Allied and American Resources to Produce a Credible, Collective Conventional Deterrent (Washington, D.C., 1988). The comprehensive and impressive study identifies the shortfalls in combat sustainability which merges the twin aspects of consumer and production logistics and then concentrates upon the production side. See the published summary by Thomas A. Callaghan Jr., "NATO Still in the Throes of Structural Disarmament", Armed Forces Journal International (December 1988), pp.61 and 64; see also report "New NATO Treaty Solution to Defense Economics Problems", Aerospace Daily (18 November 1988), p.261 covering the significant Callaghan study.
156. Major General Homer D. Smith, Jr., in interview with Jacob Goodwin, "Smith: Is anybody Listening?", Military Logistics Forum (September 1985), p.46.
157. Senator Sam Nunn interviewed by Peter Jenkins, "The dangers of the status quo. The unequal Alliance", The Independent (16 February 1988), p.17.

158. Bernard W. Rogers, Wall Street Journal (5 June 1984), p.16. See also edited transcript of an on-the-record Interview with General Rogers by David Buchan, Financial Times, 24 February 1987 published by SHAPE Public Information Office, ACE Output (1 March 1987), pp.1-20, in which SACEUR emphasized "...we can't fight long enough conventionally because we lack sustainability". The same view has been expressed by his relief, General Galvin see John G. Roos and Benjamin F. Schemmer, "Revolution in NATO's Conventional Defense Looms from 'Competitive Strategies' Initiative", Armed Forces Journal International (Oct 1988), p.114.
159. Ian Murray, "West Germans quarrel with BAOR Strategy", The Times (30 May 1989), p.8.
160. See K.A.P. Stevenson, "Praise the Lord and pass the Ammunition", Royal Artillery Journal (September 1984), p.95. The following comment concerning UK's artillery resources is significant:

It is all too clear, therefore, that Britain has no current plan to find an adequate overall mix of artillery weapons and ammunition. If anything it is falling far behind already inadequate plans.

(Anthony H. Cordesman, NATO's Central Region Forces (London, 1988), p.148).

161. Major General Homer D. Smith, Jr., interviewed by Jacob Goodwin, "Smith: Is anybody Listening?", Military Logistics Forum (September 1985), p.44.
162. It is difficult to argue with the political and rational view (the two are not always mutually exclusive), expressed by Senator Sam Nunn that:

It's absolute foolishness for us to continue to have a very large part of our military budget going to reinforce NATO from the United States in a crisis if those forces get to Europe at a point in time when the Europeans have given out of ammunition.

(Interview by Peter Jenkins, "The dangers of the status quo. The unequal Alliance", The Independent (16 February 1988), p.17).

163. Major General Erwin M. Graham, Jr., "The Dynamism of Army Combat Logistics", Military Review (April 1976), p.70.
164. The description 'layer-cake' to portray the eight Allied Corps deployment sectors in NATO's Central Region is a term used by a number of commentators. For example; see Bruce D. Berkowitz, American Security: Dilemmas for a Modern Democracy (New Haven, 1986), p.130; and David Greenwood, "Towards Role Specialization in NATO", NATO's Sixteen Nations (July 1986), p.46.
165. The remarks by Major General Homer D. Smith, Jr., who was the US Defence Attaché in Saigon in 1975 are telling:

We expected the (South) Vietnamese to fight with decreasing quantities of ammunition... When Congress cut off the money and the South Vietnamese army's ammunition stockpile began to decrease, morale went down very quickly.

(Interview by Jacob Goodwin, "Smith: Is Anybody Listening?", Military Logistics Forum (September 1985), p.44).

166. Senator Sam Nunn interviewed by Peter Jenkins, The Independent (16 February 1988), p.17. This perception is shared by a Professor Emeritus of Massachusetts Institute of Technology:

The general assumption seems to be, however, that both sides will have available the logistical systems necessary to keep the combat forces supplied, but that NATO is likely to run out of war reserve stocks - particularly ammunition and spare parts - well before the Pact.

(William W. Kaufmann, "Who Is Conning the Alliance", The Brookings Review (Fall 1987), p.16).



167. For the 3 to 1 rule-of-thumb see Steven Canby, "The Alliance and Europe: Part IV Military Doctrine and Technology", Adelphi Paper 109 (Winter 1974/5), p.5; see also James A. Huston, One for All (Newark, Delaware, 1984), p.96; see also Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, North Atlantic Assembly Report Conventional Defence in Europe (Brussels, 1985), p.10; and Joshua M. Epstein, "Dynamic Analysis and the Conventional Balance in Europe", International Security (Spring 1988), pp.155-158. For an assessment backed by the Office of the Chief of Staff, Department of the Army, Washington, D.C., see Kim R. Holmes, "Measuring the Conventional Balance in Europe", International Security (Spring 1988), pp.166-167. Michael Sadykiewicz in a most comprehensive paper notes:

The Soviet principle of mass (ie; the density of forces and means) demands the concentration of combat power at a decisive time and place.

(Michael Sadykiewicz, "Soviet-Warsaw Pact Western Theater of Military Operations: organization and Missions", RAND Study dated August 1987, p.16).

The above principle does not differ significantly from the view expressed by another military thinker nearly 150 years earlier (1838):

Indeed if the art of war consists in throwing the masses upon the decisive points, it is necessary to take the initiative. The attacking party knows what he is doing and what he desires to do; he leads his masses to the point where he desires to strike.

(J.D. Hittle, ed., Jomini and his summary of The Art of War (Harrisburg, PA, 1947), p.69).

168. For a comprehensive assessment of axis of attack and local force ratios specific to the eight corps areas of Allied Forces Central Europe see Bruce D. Berkowitz, American Security. Dilemmas for a Modern Democracy (New Haven, 1986), pp.132-150 and in particular the diagrams at p.147.

169. In commercial life a retailer would not stock say eight stores with a full inventory of expensive items to cater for a possible rush demand in perhaps only four stores which could not be identified. The shrewd manager would hold sufficient stocks centrally to cover the increased demand for four as opposed eight stores and ensure transport was available to rush stocks to the appropriate outlets as the demand became apparent. For a commercial background see James R. Stock and Douglas M. Lambert Strategic Logistics Management (Homewood, Illinois, 1987), pp.394-437; see also Don Firth, et al; Profitable Logistics Management (Toronto, 1988), pp.289-315 for distribution resource planning technique.
170. Geoffrey Ashcroft, "Military Logistic Systems in NATO: The Goal of Integration. Part II: Military Aspects", Adelphi Paper 68 (June 1970), p.13.
171. Ibid, p.13.
172. Steven Canby, "The Alliance and Europe: Part IV Military Doctrine and Technology", Adelphi Paper 109 (Winter 1974/5), pp.19-21.
173. See a critique in part of Steven Canby's thesis by Kenneth Hunt, "The Alliance and Europe: Part II: Defence with Fewer Men", Adelphi Paper 98 (Summer 1973), pp.27-28.
174. For example: Geoffrey Ashcroft in 1970, Steven Canby and Kenneth Hunt in 1983/4, and C.J. Dijkstra in 1983.
175. The Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), was released in December 1988.
176. Report of the Secretary of Defense Frank C. Carlucci to the Congress on the FY 1990/ FY 1991 Biennial Budget and FY 1990-94 Defense Programs dated 17 January 1989, pp.61-62.

177. The Report by NATO's Defence Planning Committee, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance (Brussels, 1988), p.79.
178. Senator Sam Nunn interviewed by Peter Jenkins, The Independent (16 February 1988), p.17).
179. An appropriate comment from Major General Homer D. Smith, Jr., at NATO Headquarters:  
  
I'm a hunter and I know that  
nobody in their right mind would  
go duck hunting with three shells  
in his pocket.  
  
(Jacob Goodwin, "Smith: Is Anybody Listening?", Military Logistics Forum (September 1985), p.44.
180. Claude M. Kicklighter, "The Central Europe Pipeline System", NATO's Fifteen Nations (Special 2/1981), p.88.
181. C.J. Dijkstra, "Collective logistical support", Western European Union Document 966 (Paris, 1983), p.30.
182. Geoffrey Ashcroft, "Military Logistic Systems in NATO", Adelphi Paper 68 (June 1970), p.13.
183. Observers will have noticed the distance between words and deeds in respect of the regular affirmation by Allied Defence Ministers to increase annually their countries defence expenditure by 3%, see note 62 above. The annual submission of a national reply to the DPQ provides scope for adjustment should a country wish to present a more positive, but maybe slightly inaccurate situation report.
184. The NATO definition of 'interchangeability' is:  
  
A condition which exists when two or more items possess such functional and physical characteristics as to be equivalent in performance or durability, and are capable of being exchanged one for the other without alteration of the items themselves, or of adjoining items, except for adjustment, and without selection for fit and performance.

(NATO Glossary of Terms and Definitions  
AAP-6(P)).

185. Ken Perkins, Weapons and Warfare (London, 1987), p.270.
186. As a guide, for 5% of total ammunition costs there is no doubt that sufficient tactical transport, together with personnel, could be provided to guarantee delivery of NATO pooled stocks to any location on the battle-field.
187. Colonel Jan Schouten, formerly Assistant Chief of Staff for Logistics, NATO's Northern Army Group. Interviewed by the author in Deventer, The Netherlands, 15 March 1989.
188. The Northern Army Groups' new concept of operations outlined in UK's Statement on the Defence Estimates 1986 Vol 1, p.33, rightly places emphasis on a mobile tactical concept to permit defenders to seize the initiative from the aggressor.
189. 'The right level' for control of logistics has to be at the operational level. A commander who does not control logistics is not a commander, he can only monitor.

N A T O U N C L A S S I F I E D

ORIGINAL: ENGLISH  
20th February 1989

WORKING PAPER  
AC/112-WP/94  
AC/112(WG/4)WP/38(Revised)

NATO PIPELINE COMMITTEE

AND ITS

WORKING GROUP NO. 4 ON FUELS (WG/4)

SINGLE FUEL CONCEPT (SFC)

Note by the Staff Officer

1. Following the discussions at meeting 32 of the WG/4 the original document<sup>(1)</sup> and the comments submitted by the United States<sup>(2)</sup>, a revised text has been prepared and is at the Annex.

2. In order to move ahead, this version is now circulated to both the NPC and WG/4. The latter is invited to agree this text under the silence procedure ending 3rd April 1989. For the NPC this WP will appear on the agenda for its April 1989 meeting and will only be discussed if the WG/4 silence has not been broken.

3. Unless I hear to the contrary by 3rd April 1989, WG/4 will be deemed to have agreed this text which will appear on the NPC Agenda.

(Signed) D.A. SIMPSON

This document contains: 1 Annex

NATO,  
1110 Brussels.

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- (1) AC/112(WG/4)WP/38  
(2) AC/112(WG/4)N/64

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N A T O   U N C L A S S I F I E D

ANNEX to  
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THE SINGLE FUEL CONCEPT (SFC)

INTRODUCTION

1. The "Single Fuel Concept" is now the accepted description of the goal proposed by the NATO Pipeline Committee's (NPC) Working Group No. 4 on Fuels and agreed by the NPC at its May 1987 Meeting <sup>(1)</sup>. That goal is worded as follows:

"To achieve equipment interoperability through a single fuel for use on the battlefield and for land based air operations, ensuring that the specification of that fuel is standardised with its commercial equivalent in common use in NATO Europe, and that its physical and chemical characteristics are such that it can be introduced, stored, transported and distributed by the NATO Pipeline System (NPS)".

2. The concept concerns fuel for ground vehicles and equipments and land based military aircraft. It does not include naval fuels but could cover amphibious forces ashore. Similarly it does not apply to the high density and high stability fuels used for special applications.

3. Geographically, the concept applies to NATO Europe.

THE MAIN PRINCIPLES

4. For the concept to succeed in whole or part there are five main principles, namely:

- (a) that conversion F-40 to F-34 is complete;
- (b) that only compression ignition or turbines are used to power ground vehicles and equipments in the forward areas;
- (c) that as a result of (b), the use of gasoline is eliminated in the forward areas;
- (d) that the same fuel without any operational constraints can be used to power land based military aircraft and ground vehicles and equipment using compression ignition or turbine engines;
- (e) that the selected fuel is readily available, satisfies all military storage and bulk distribution criteria and is basically the same as the commercial aviation turbine fuel in common use in NATO Europe.

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<sup>1)</sup> AC/112-D/213.

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5. Fuel storage and distribution facilities and equipment must be designed and maintained with the capability to receive, store, and issue alternate grades of petroleum products when the primary grade cannot be obtained in sufficient quantity to meet operational requirements.

SELECTED FUEL

6. There is only one fuel that could meet the requirements. It is the kerosene based aviation turbine fuel, F-34. It differs from commercial JET A-1 (NATO Code F-35) only through the need for an additive package.

THE STAGES OF THE SFC

7. There are three stages:

- (a) STAGE 1 The total elimination of F-40 and its replacement by F-34 for use by land based military aircraft in NATO Europe.
- (b) STAGE 2 The adoption of F-34 (or F-35) as a replacement for diesel fuel starting in the forward areas.
- (c) STAGE 3 The total elimination of the gasoline requirement.

IMPLEMENTATION

8. STAGE 1 can be implemented without any significant delay throughout NATO Europe. The target date for completion is mid-1990, except for Turkey where it depends upon the phasing-out of certain aircraft types.

9. STAGE 2 can be carried out independently by each nation in accordance with their own programme fully co-ordinated with other user nations.

10. STAGE 3 will take much longer as it depends on nations' equipment procurement policy and vehicle inventories, active and reserve.

EQUIPMENT ASPECTS

11. The future design of land based military aircraft, vehicles and ground equipment will be primarily based on the use of F-34. Performance data re other fuels (e.g. F-40, diesel etc) will be determined and recorded as appropriate to the design requirements of the equipment concerned.

12. All nations should introduce a policy to procure only compression ignition/turbine powered military vehicles and ground equipments.

13. A programme of tests is being undertaken to clear F-34/F-35 for use in existing ground vehicles and equipments.

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WAY AHEAD

14. For STAGE 1:

- (a) continue monitoring the conversion F-40 to F-34 for the use of land based military aircraft in NATO Europe;
- (b) set target date for total conversion in NATO Europe of mid-1990, except for Turkey;
- (c) contribute to the PPC study into JET A-1 availability in NATO Europe;
- (d) maintain close liaison with all bodies, the specification authorities and the oil industry in order to avoid any deviations between the specifications of JET A-1 and NATO F-35, the base fuel for F-34.

15. For STAGE 2:

- (a) continue monitoring the conversion of military diesel fuels to F-34/35;
- (b) continue to progress the completion of all technical tests with F-34/35 of ground vehicles and equipments;
- (c) set target date for the completion of all testing;
- (d) receive details of the procurement policy for each nation relative to the type of power unit for future ground vehicles and equipments.

16. For STAGE 3:

- (a) encourage the early phasing out of gasoline powered military vehicles and equipments, initially in the forward areas;
- (b) encourage the early withdrawal of gasoline from the forward extensions of the NPS and its substitution by F-34/35;
- (c) encourage total withdrawal of gasoline from the NPS.

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OTHER ASPECTS

17. Arising from the implementation of the SFC there are related aspects for action, namely:

- (a) With regard to the specification of JET A-1(F-35):
  - (i) For aviation use, the closest co-ordination and co-operation will have to be continued between the military and civil sides to keep the respective specifications interchangeable.
  - (ii) For the use of F-34/35 by ground vehicles and equipment, every effort should be made to avoid the adding of new specification requirements for JET A-1 (F-35).
  - (iii) STANAGs covering F-34 and F-35 should no longer have a caveat about not releasing their contents to industry, except, maybe for STANAG 1110.
  - (iv) Special attention should be paid to the possible proliferation of standardization authorities as a result of the EEC goal for a single market in 1992, particularly in respect to the future role of the comité européen de normalisation (CEN).
- (b) Related to Pipeline Drag Reducer additives include in the clearance process for their use in aviation turbine fuels, tests covering ground vehicles and equipments.
- (c) For procurement, standardize terminology avoiding the use of confusing descriptions.
- (d) With regard to high density and high stability fuels discourage any moves to increase their use for other than special applications.

SUMMARY AND WAY AHEAD

18. The goal to use a single fuel on the battlefield is known as the Single Fuel Concept. It is applicable to NATO Europe and consists of three stages. The fuel is commercial JET A-1 with an additive package. The use of gasoline is to be gradually reduced and eventually eliminated from forward areas as nations cease the procurement of spark ignition vehicles and equipment. As an interim step nations should periodically evaluate their gasoline requirements with the goal of reducing consumption to the point where gasoline can be eliminated from the NPS.

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19. While there is a mid-1990 target date to complete Stage 1 - conversion F-40 to F-34<sup>(2)</sup>, the implementation of the other two stages depends upon many factors. Therefore, each nation should set its own pace but in full consultation with all interested parties. The execution of all stages and the related aspects requires careful monitoring. This is the task of the NATO Pipeline Committee and in particular its Working Group No 4 on Fuels.

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2) Except Turkey, see paragraph 8.

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## CHAPTER 5 - INTEROPERABILITY

Interoperability is defined within NATO as:

The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together.<sup>1</sup>

Its importance increases in proportion to the decrease in military resources, for if provided within a sufficiency of equipment and stocks, it is doubtful that military authorities would wish to become involved in an area of greater civil/economic common interest.<sup>2</sup>

It could be argued that, in certain circumstances, a variety of weapons systems could enhance rather than degrade the deterrence posture of the Alliance. However, the "logistic shortfalls"<sup>3</sup> of the Alliance has led to the following comments by the Supreme Allied Commander Europe:

The effectiveness of NATO defenses is also degraded by the lack of interoperability of equipments from its various nations. While the Warsaw Pact equipment has a great deal of commonality, NATO has, for example, eight different main battle tanks firing four different kinds of ammunition. Although national desires to maintain independence in the

area of weapons development and production are understandable, in an era of increasingly scarce resources we can no longer afford such inefficiencies.<sup>4</sup>

Interoperability is however inextricably linked to NATO Standardization which, while having the aim formulated in 1982 to increase the effectiveness of the military forces of the Alliance is limited to the principle that standardization is voluntary.<sup>5</sup> The North Atlantic Council paper<sup>6</sup> outlining the principles of NATO standardization emphasizes the need for political will and identifies two interacting military and economic aims. It also gives a general perspective of technical, operational and managerial requirements in the area of interoperability, without stating priorities. A copy of this unique document is at Appendix A to this Chapter.

Although a Military Agency for Standardization (MAS) was established in 1951 "to foster military standardization with the aim of enabling NATO forces to operate together in the most effective manner",<sup>7</sup> its work of coordinating staffing and promulgating NATO Standardization Agreements (STANAGs) is hampered to a degree by the 'voluntary principle', which means that standardization cannot be imposed.<sup>8</sup> Standardization proposals mainly originate from national staffs; but the process of agreement, ratification and imple-

mentation of Standardization Agreements (STANAGs) is alas a slow process due to international systems and 'national interest' screenings.<sup>9</sup> However, according to Mr Jan Van Houwelingen, the Secretary of Defence for the Netherlands, "Standardization is the ideal, interoperability is indispensable".<sup>10</sup>

\* \* \*

The perception that interoperability is 'indispensable' is understandable given the present economic climate within NATO countries coupled with the ever rising costs of defence equipment which has led to the coining of the phrase: "Structural Disarmament" by Thomas Callaghan meaning:

...the disarmament phenomenon of more and more money producing fewer and fewer weapons, less "readiness", and even less combat sustainability.<sup>11</sup>

The economic advantages of interoperability<sup>12</sup> when associated with armaments cooperation have the greatest significance for high technology items which involve high research costs, or the low technology high numbers purchases.<sup>13</sup> The acquisition of interoperable armaments in between these two areas offers few financial savings. Lower costs are important but effective management is of greater significance.

The essential rationale for interoperability within NATO's integrated military structure concerns:

- Firstly, everything to do with command and control<sup>14</sup> and this involves not only communications equipment compatibility, but also procedures.
- Secondly, the high consumption and very expensive supplies,<sup>15</sup> in other words ammunition and its mobility.<sup>16</sup>

It is suggested that these two areas are the most vital aspects of resource management in the Alliance today, and it is these two battlefield considerations which must be the starting point for any real 'resources strategy'.<sup>17</sup> With regard to the status of interoperability within command and control systems:

The British Ptarmigan tactical radio system is one of seven different systems operated by NATO nations which are unable to communicate with one another without the use of expensive and vulnerable interface devices and gateways.<sup>18</sup>

This damning criticism for an Alliance celebrating forty years of cooperation is echoed for command and control of the air where NATO's air defence posture has been described by the Vice Chairman of the NATO

Air Defence Committee, as inadequate now and for the foreseeable future.<sup>19</sup> The lack of a NATO identification system (NIS) and an adequate identification system friend or foe (IFF) for the air battle is an indictment of the 'voluntary' principle of standardization so carefully detailed by the North Atlantic Council (at Appendix A). In the words of the Vice Chairman of NATO's Air Defence Committee:

For almost two decades some nations have just refused to procure the available systems which could, at least, have provided standardization. All attempts to agree on a more effective NATO Identification System (NIS), which cannot be easily jammed or decoded by the Warsaw Pact were frustrated, as one or the other nation just "left the conference table".<sup>20</sup>

Low level airspace management also presents serious command and control interoperability problems. With the planned increase use of helicopters for low level operations in NATO's Rear Combat Zone (RCZ), there will be a "large number of helicopter movements by the 4,000 helicopters in the Central Region",<sup>21</sup> it may concern Army and Air Force personnel to realize that at present there is "no known standardized procedure within NATO for managing corps controlled airspace".<sup>22</sup> Given the current speed of action<sup>23</sup> with 'voluntary' standardization agreements, perhaps a similar timescale involved in the selection of a NIS may apply.



Moving from interoperability of command and control to interoperability of logistics presents a more positive picture. Out of the three essential combat supplies required to enable troops to fight - Class I, III and V; Class III fuel, is standardized within NATO and is subject to NATO control at the right level. The fact that ammunition is also high consumption and expensive makes it an essential logistic resource which should also be interoperable and subject to NATO controls in the same way as with fuel; however, while the 'principles of NATO standardization'<sup>24</sup> stress that the military aim is to increase combined operational effectiveness of Allied forces, true progress is slow.<sup>25</sup>

\* \* \*

Because of the complexity of ammunition the term 'interchangeability' is used in preference to 'interoperability' for Class V Supplies as a means to more closely define the requirements. The narrowing down of a seemingly adequate term may appear semantic; but terminology used within an organization comprising 16 nations and employing two official languages<sup>26</sup> requires that all definitions are as precise as possible. The NATO definition of interchangeability is given as:

A condition which exists when two or more items possess such functional

and physical characteristics as to be equivalent in performance or durability and are capable of being exchanged one for the other without alteration of the items themselves or of adjoining items, except for adjustment, and without selection for fit and performance.<sup>27</sup>

It is with the above terminology in mind that the Army Board of NATO's Military Agency for Standardization established a Land Forces Ammunition Interchangeability Working Party and keeping to the 'voluntary' spirit of standardization, the Working Party comprises only delegates of those NATO nations, commands and agencies that agree to participate. Its main role is to undertake studies into the interchangeability of ammunition for war and includes specific tasks to:

Identify all NATO ammunition of the same calibre used by two or more of the NATO land forces, giving priority to artillery, tank and mortar ammunition, and develop a catalogue of ammunition and weapons commonly used by NATO land forces which will show what ammunition can be interchanged and effectively fired by each national weapon system, distinguishing between interchangeability for wartime emergency use and training in peacetime.<sup>28</sup>

Its work has resulted in the publication of a Land Forces Ammunition Interchangeability Catalogue; which stresses that "ammunition listed in this document is interchangeable only in war except where otherwise specified".<sup>29</sup> The development and publication of NATO

Standardization Agreements (STANAGs) has already been described as a slow process; however, with the exception of small arms (infantry) ammunition there is a paucity of STANAGs for munitions. For example, there are no STANAGs covering primers, propelling charges, projectiles or fuzes for the following calibres of artillery: 105 mm, 155 mm, 175 mm and 203 mm. 'Interchangeability' has become a watch-word in the realms of NATO ammunition standardization where perhaps emphasis should be placed upon the word 'watch'.<sup>30</sup>

\* \* \*

To illustrate the practicalities of 'interoperability' on the dynamic European battlefield of today, let us take a scenario that one of the Allied Corps in the Central Region, defending against a strong enemy thrust, was running short of 155 mm ammunition. Then let it be assumed that the national US command either due to good husbandry or lack of pressure on its own Corps sectors, was able to offer assistance with an emergency loan of compatible 155 mm ammunition. There would be difficulty concerning cross-Corps exchange as procedures have yet to be developed covering the transfer of Class V supplies across the boundaries of two national corps.<sup>31</sup> Nevertheless, assuming that all went well, the receiving Corps in combat would be unable to shift the pallets of 155 mm ammunition

from the American truck without breaking bulk because its fork-lift truck is incompatible with the US pallet size which is not NATO standard. The European nations forks would not fit the narrow gap at the base of the US pallet; furthermore, if the receiving Corps happened to be British, it would be unable to set the fuzes of the shells as it uses electronic fuze setters which only now are just being introduced into US service.

The above example is not designed as a criticism of the US for using non-NATO standard pallets for they have sound national logistic reasons to retain their slim-line pallets. It is stressed there is a need for communication within the Alliance today so that differences are known and understood. With forethought and planning European nations could purchase mechanical handling equipment fork extenders, which are relatively inexpensive, to assist interoperability with US forces in times of crisis when speed and efficiency really counts.

The Allied forces in NATO's Central Region are well aware that there are likely to be severe procedural and practical problems in transferring Class V ammunition supplies across the boundaries of two separate national Corps.<sup>32</sup> However, recognition of the problem provides no guarantee that efforts will be made to solve it. In 1986 at the 12th Meeting of NATO's Mili-

tary Agency for Standardization Land Forces Logistics Working Party,<sup>33</sup> the US representative gave a:

...briefing on the essentiality of common knowledge of ammunition procedures among the member nations. The briefing covered the need to select compatible ammunition types from the stocks of all nations; ammunition packaging and handling developments in the US; and the need for common training in ammunition ordering, packaging and shipping procedures.<sup>34</sup>

As a result of this briefing a group of Working Party members drafted a 'statement of the problem'. The indications at that stage seemed that the aim was to solve the problem; however, the study was cancelled at the subsequent Working Party meeting in 1987,<sup>35</sup> thus the problem still remains. The types of fuzes in use within NATO represents another example where communications and forethought would benefit the Alliance as a whole; but as already noted, this data has yet to be agreed and notified within NATO STANAGs.

A logistics study which is making headway in NATO<sup>36</sup> received a mention by the Chief of Staff of the US Army, General Carl Vuono who, while noting that logistics is a national responsibility, felt that the development of a logistics doctrinal publication should "build on allied logistic interoperability".<sup>37</sup> It is hoped that he is proved correct and real progress continues; however, experience shows that full



development takes time.<sup>38</sup> An appropriate quote from the ratification draft of the proposed NATO document named Land Forces Logistics Doctrine summarizes the position within the context of interoperability:

Logistics cannot be viewed from a purely national perspective, but requires cooperation among NATO nations to achieve effectiveness, both in peace and in war. Logistic interdependence requires a commitment of other nations logistic requirements equivalent to one's own.<sup>39</sup>

\* \* \*

In the general area of NATO standardization and interoperability, a greater emphasis is often placed upon the acquisition of the more visible weapon systems and military equipment. It attracts domestic political and economic attention within the procurement process, which may carry more weight than the interests of NATO cooperation and standardization. It is natural that expenditures of vast sums of money for equipment purchases attract more attention than other factors within a military Alliance; however, sound interoperability of command and control and operational procedures could create more realistic 'fighting power',<sup>40</sup> than the much lauded procurement of war machinery.

The most important contribution to interoperability

within NATO concerns the provision of effective command and control systems and the development of cooperative procedures. These two interrelated areas outstrip the advantages of the myriad types of battlefield hardware; for without proper command and control and commonality of procedures within NATO, the fighting machine lacks proper direction and timing. This observation is quite clear and basic. While the provision of command and control systems represents, albeit essential expenditure, there are many procedures which would enhance Allied effectiveness and would cost little except clarity of thought and deed.

NATO's Military Agency for Standardization (MAS) is tied to the 'principles of NATO standardization',<sup>41</sup> of voluntary effort and therefore can only deal with national proposals, or NATO command proposals which in turn must be agreed by nations. Against this 'voluntary' background it is not surprising that important working parties meet at NATO Headquarters at best annually.<sup>42</sup>

There is sufficient scope within this complex subject for a separate paper to identify areas within NATO's Central Region where interoperable procedures would provide significant benefits. However, the aim of this Chapter has been to provide a general feel for the problem and to highlight some key areas. To start

with, in a multi-nation military Alliance the responsibilities of each level of command should be the same. Procedures and staff organizations within the military headquarters should also be common. Cross-Corps logistic procedures should be the same as should field logistic systems. At present the focus of interoperability tends to fall upon the equipment procurement end; whereas it is suggested that standardization starting at the consumer on the battlefield would provide greater benefits at less costs. In the words of one German ally:

The most important element of an integrated defence is the interoperability of forces and equipment. Its prerequisite is the technical compability of the weapon systems and the equipment, and the application of common command and control doctrines and operational procedures.<sup>43</sup>

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## NOTES - CHAPTER 5

1. NATO Glossary of Terms and Definitions AAP-6.

2. In this area of standardization it has been noted that:

...although the economic and military aspects are not directly incompatible, in many ways they do not sit comfortably together.

Trevor Taylor, Defence, Technology and International Integration (London, 1982), p.61).

3. General John R. Galvin, "Comparing Forces - NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1989), p.23.
4. Ibid, p.23. See also the Special Report of the North Atlantic Assembly Committee NATO in the 1990s (Brussels, 1988), pp.31-32; and Major General Rowley Mans, "Europe: Stop Arguing and Collaborate", The Army Quarterly and Defence Journal January 1987), pp.14-23; also Leonard Sullivan, Jr., and Thomas H. Etzold, "Security and Stability in Conventional Forces: Differing Perceptions of the Balance", consultation draft occasional paper The Atlantic Council of the United States (Washington, D.C., 1988), p.46.
5. The following extract from NATO document 'The Military Committee Policy on Standardization' is pertinent:

From a military point of view,  
standardization should be guided  
by the following basic principles:

- a. Standardization is voluntary.
- b. Standardization is not an end in itself.

(North Atlantic Military Committee document MC20/8 (Final) dated 3 April 1984, p.2).

6. NATO document C-M (82) 26 dated 7 April 1982.
7. NATO Handbook 1986 (Brussels, 1986), p.54; see also Terms of Reference of The Military Agency for Standardization, NATO document MC20/8 (Final), Annex A.

8. The first stated 'Guiding Principle' of The Military Committee Policy on Standardization is that 'standardization is voluntary', see NATO document MC20/8 (Final).
9. See Major General Pat Mitchell, "Increasing the Combined Operational Effectiveness of NATO Forces: The Role of the Military Agency for Standardization", NATO Review (No 1/1984), pp.16-19; see also Thomas A. Callaghan, Jr., a report prepared for the US Department of Defense, Pooling Allied and American Resources to produce a Credible, Collective Conventional Deterrent (Washington, D.C., 1988), p.69.
10. Jan Van Houwelingen, "Towards European Defence Industry", NATO's Sixteen Nations (October 1985), p.45.
11. Thomas A. Callaghan, Jr., "NATO Still in the Throes of Structural Disarmament", Armed Forces Journal International (December 1988), p.61.
12. See a report by the Independent European Programme Group, Towards a Stronger Europe (Brussels, 1986), Volume 1, pp.1-2.
13. See Michael Moodie, "Managing Technological change: an Alliance imperative", NATO Review (August 1986), pp.21-27; see also Robin Beard, "New NATO Approaches to improved armaments cooperation", NATO's Sixteen Nations (November 1986), pp.26-27, 29 and 32; also Robin Beard, "NATO armaments cooperation: picking up the gauntlet", NATO Review (February 1987), pp.10-15; see also John Eisenhower, "Hard facts force military down road of cooperation", The Independent (1 December 1988), p.14.
14. Highlighted by the Supreme Allied Commander Europe:

In our efforts to be able to move forces quickly from one sector to another, we must overcome the national and service boundaries that tend to be erected by different communication systems.

(General John R. Galvin, "Cooperation in armaments production - a key element of deterrence", NATO Review (October 1988), p.21); for a comprehensive technical appreciation see Siegfried Seiffert, "Technical Interoperability of the



Command, Control and Information System in the Central Region", Military Technology (No. 5/1987), pp.92-95.

15. It has been noted that ammunition consumption "reached unprecedented levels in the 1983 Arab-Israeli War" - Trevor Taylor, Defence, Technology and International Integration (London, 1982), p.41; and for an indication of expense see Chapter 4 Notes 9 and 10 for 'smart' and 'non-smart' munitions respectively.
16. The cost of providing battlefield mobility for Class V supplies is minimal in comparison to the purchase price of the ammunition, Chapter 4 Note 186 refers.
17. At present a NATO resource strategy is targeted to the defence industry production where national economics and political interests often merge, vividly described by Major General Rowley Mans as "using defence as a political football to be kicked into touch every time some other transitory electoral moonbeam appears in the sky" (see Note 4 above); but this is the wrong place. The key is to define the requirements from the consumer end - the battlefield, and permit the production end - the defence manufacturers and political allies to meet a consolidated consumer demand.
18. Gabriel I. Ferenczy, "CIS in Support of CDI: Improving NATO's Conventional Defences; the vital role of Communication and Information Systems", NATO's Sixteen Nations (April/May 1988), p.60. This comment by the Secretary of State for Defence of the Netherlands is also strikingly relevant:

Command, control and communications will increasingly be exercised, not at army level or below, but for the European Central Region as a whole. Is it sensible therefore to have different national forward communications systems such as the British Ptarmigan, the French RITA and the German Autoko II.

(Jan Van Houwelingen, "Hanging Together - The MOU Process in Transatlantic Armaments Cooperation", NATO's Sixteen Nations (December 1987) - January 1988), p.26).

19. See Major General J.A. Bahnemann, "Extending Air Defence - A Test Case for the Western Alliance", NATO's Sixteen Nations (September 1988), p.48.

20. Ibid; one sentence stands out:

In the field of interceptor fighters one must gain one impression that the most common interest for NATO nations is not to provide the greatest defence capability at a reasonable cost, but rather the desire to avoid compromises.

See also US comments on the lack of NIS and IFF in NATO in the document prepared by the Joint Staff United States Military Posture FY 1989 (Washington, D.C., 1988), p.19.

21. Statement of the Working Party Chairman - Low Level Airspace Management who also noted:

The capability and mobility of helicopters on the modern battlefield will be greatly reduced by the current procedures for inter-Corps and inter-Army Group operations.

(NATO's Military Agency for Standardization Report to the Army Board of the 12th Meeting of the Helicopter Interservice Working Party (7 April 1989), Annex E to MAS (Army) 143 - I/HIS).

22. Ibid.

23. Speed is hampered by the national 'voluntary' aspect of standardization; see Note 8 above.

24. See Appendix A to this Chapter.

25. The following comment by the then Chairman of NATO's Military Agency for Standardization on problem areas is significant:

The first is the inadequate coordination between the various tasking authorities of NATO, which results in duplication of effort... The second problem that worries us is the speed of ratification and implementation of STANAGs by nations. Obviously, the sooner nations implement an agreement,

the sooner the Alliance will benefit from it. However, until nations make a conscious effort to ratify and implement as quickly as possible, standardization will continue to grind its way forward very slowly.

(Major General Pat Mitchell, "Increasing the Combined Operational Effectiveness of NATO Forces", NATO Review (No 1/1984), p.19.

26. The two official languages of NATO are English and French. This is applicable within all NATO International Staff organizations whether civil or military.
27. NATO Glossary of Terms and Definitions AAP-6.
28. Terms of Reference for the Land Forces Ammunition Interoperability Working Party; NATO Document MAS (Army) 695-1/AMMO (TOR) dated 30 December 1985, p.1-2.
29. Land Forces Ammunition Interchangeability Catalogue AOP-6 (C).
30. Matrix of current state of ammunition STANAGs provided by NATO's MAS:

	Size (mm)				
INF WPNS	5.56	7.62	9	20	25
AIR DEFENCE	40				
TANK	NIL				
ARTILLERY	NIL				

31. At present there are no STANAG's to cover this contingency.
32. Major General Homer D. Smith, Jr., Director of Logistics, raised this subject when interviewed by the author at NATO Headquarters, Brussels 21 January 1987.
33. Which took place at NATO Headquarters, Brussels on 24-28 January 1986.
34. NATO's Military Agency for Standardization Report to the Army Board of the 12th Meeting of the Land Forces Logistics Working Party,

Reference MAS (ARMY) 219-1/LOG dated 19 March 1986, p.7.

35. NATO's Military Agency for Standardization Report to the Army Board of the 13th Meeting of the Land Forces Logistics Doctrine Working Party, Reference MAS (ARMY) 083-1/LOG dated 26 March 1987, p.9.
36. The development of a Logistics Doctrine for NATO Land Forces.
37. General Carl Vuono, "Providing Modern Conventional Forces to NATO", NATO's Sixteen Nations (October 1988), p.86.
38. See Major General Pat Mitchell, Note 25 above.
39. NATO Land Forces Logistics Doctrine ALP-9 (First Draft, September 1989), p.2-2.
40. 'Fighting power' comprises a mix of many variables first mentioned in Chapter 1; however, effective communications and an understanding of the meaning is the very first essential of a control system.
41. NATO document MC20/8 (Final) dated 2 April 1984.
42. For example, the Helicopter Interservice Working Party, the Land Forces Ammunition Working Party and the Land Forces Logistic Doctrine Working Party - all meet annually.
43. Klaus Wittmann, "NATO's Front Line", Defence (April 1988), p.262. See also James Clay Thompson and A. Grant Whitley, "Evaluating NATO's Efforts to Achieve Standardization and Interoperability", in Linda P. Brady and Joyce P. Kaufman, eds., NATO in the 1980s. Challenges and Responses (New York, 1985), pp.139-164.

N A T O U N C L A S S I F I E D

ORIGINAL: ENGLISH/FRENCH  
7th April 1982

DOCUMENT  
C-M(82)26

SUBMISSION OF "PRINCIPLES OF NATO STANDARDIZATION"Note by the Secretary General

The Working Group on Rationalization, Standardization Interoperability: Improvement of NATO Standardization Agreement and the Role of the Military Agency for Standardization (MAS) (AC/308) was established in April 1979 following the decision by the Council to arrange for a combined CNAD/Military Committee review to be conducted as defined in PO/79/12(Revised).

2. The Group progresses slowly and the final report to Council is not yet ready. However, "Principles of NATO Standardization" have been developed and were agreed by the Group for submission to the Council.

3. Therefore, I recommend that the Council:

- (a) endorses the "Principles of NATO Standardization" contained in the report at Annex;
- (b) requests the Working Group to use these principles as the basis for its final report;
- (c) invites the appropriate NATO organizations to use these principles in their work and to implement them as required.

4. Unless I am advised to the contrary by close of business on 30th April 1982, I will assume that the Council accepts these recommendations.

(Signed) Joseph M.A.H. LUNS

NATO,  
1110 Brussels.

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## N A T O   U N C L A S S I F I E D

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### PRINCIPLES OF NATO STANDARDIZATION

#### Report by the Working Group

NATO Standardization is the process of formulating, agreeing, implementing and updating standards for use within NATO. NATO standardization is one means by which Alliance nations may develop their collective capability to resist armed attack as required by Article 3 of the North Atlantic Treaty. It carries additional political value as an outward demonstration of co-operation and solidarity. NATO standardization is voluntary and is not an end in itself.

#### AIMS

1. The overall aim of NATO standardization is to increase the effectiveness of the military forces of the Alliance. This overall aim has interacting military and economic (including industrial) components, and its attainment depends on political will:

- (a) The military aim of NATO standardization is to increase the combined operational effectiveness of the military forces of the Alliance.
- (b) The economic aim of NATO standardization is to increase overall efficiency in the use of available Alliance defence resources. This includes, among other things, increasing co-operation and eliminating unnecessary duplication among Alliance nations in research, development, production, procurement and support of defence systems and equipment.

#### SCOPE

2. NATO standardization is a broad process which may be applied to any NATO activity. NATO standards are normally classified into one of three main groups as follows, although some standards may apply to more than one group:

- (a) "Operational standards" are those standards which affect future and/or current military practice, procedure or format(1). They may apply among other things, to such matters as concepts, doctrine, tactics, techniques, logistics, training, organizations reports, forms, maps and charts.

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(1) "Operational" in this context is used in its widest sense to connote all non-material aspects involved in preparing for or conducting operations, or to ensure the interoperability of systems, units or forces. Previously, these standards were classified as "non-materiel", but more positive and descriptive terms were needed.

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- (b) "Materiel standards" are those standards which affect the characteristics of future and/or current materiel. They may cover production codes of practice as well as materiel specifications. Materiel includes complete systems (including weapons systems and supporting command, control and communications systems), sub-systems, ACSM(1) and consumables (including ammunition, fuel, supplies, stores and consumable spares).
- (c) "Administrative" standards primarily concern terminology - which apply to both the "operational" and the "materiel" fields - but this category also includes standards which facilitate Alliance administration in fields without direct military application (e.g. reporting of economic statistics).

GENERAL CONSIDERATIONS

- 3. NATO standardization is inherently a multi-national activity, requiring the harmonization of national points of view in order to achieve agreement and a national commitment to implement.
  - 4. Established NATO bodies have an inherent responsibility to propose, formulate, progress and keep up-to-date those standards which apply within the fields covered by their Terms of Reference.
  - 5. NATO nations are responsible for equipping and supporting their own military forces, and therefore only they can make ultimate decisions on the development, production and acquisition of materiel. These decisions are affected by complex national and international military, economic, technical and political factors.
  - 6. The Major NATO Commanders (MNCs) have the unique responsibility within the Alliance to plan for and, when necessary, to conduct combined military operations employing multi-national forces. The MNCs therefore have an inherent responsibility to establish standardization objectives and to recommend priorities which enhance the combined operational effectiveness of the Alliance's military forces.
  - 7. Efforts to harmonize technical specifications proposed by nations, and to further overall co-operation with a view to reducing duplication in research, development and production of armaments, are normally progress under the aegis of the Conference of National Armaments Directors (CNAD).
  - 8. The NATO Military Authorities (NMAs) participate in this process as appropriate by providing NATO military requirements and views to the CNAD and similar NATO bodies in accordance with established policy(2). The NMAs do not normally propose technical specifications for materiel.
- 
- (1) Assemblies, Components, Spare Parts and Materials
  - (2) MC 138, 22nd June 1970 and Annex I to AC/259-D/739(Final), 12th September 1979

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9. "Operational" and "materiel" standardization are interdependent. Standardization in key operational areas, such as concepts, doctrine, procedures and mission needs, will greatly enhance prospects for standardization of materiel. In turn, new technology will often require the reformulation of doctrine and will almost always result in changes to operational procedures. The full benefits of increased materiel standardization may not be achieved unless there is extensive harmonization of operation aspects. The need for improvement of interoperability of C3 systems as an integral entity is recognized.

10. The NATO standardization process encompasses a wide range of objectives, depending on the particular activity involved and the purpose of specific standards within that activity. Objectives for "operational standards" strive for the use of identical or compatible concepts, doctrines, procedures, practices or formats to enhance interoperability of Alliance forces. In the event special regional standards may be required, overall interoperability/compatibility with other regional forces should be maintained. Objectives for "materiel standards" strive for the procurement of compatible, interoperable, interchangeable or identical materiel systems for Alliance forces.

THE NATO STANDARDIZATION PROCESS

11. There are three primary actions which constitute the NATO standardization process:

- (a) formulation (or updating) of NATO standards;
- (b) agreement on NATO standards by nations individually;
- (c) implementation of agreed NATO standards as a matter of national policy.

12. The formulation of NATO standards is inherently international in character and hence must be co-ordinated internationally. In view of the wide range of Alliance activities for which standards are desirable, the formulation of proposed NATO standards will normally be decentralised. Formulation of standards can best be accomplished by multinational bodies of national experts.

13. Normally, proposed "operational" standards will be formulated by groups of experts under the aegis of the NATO Military Authorities and proposed "materiel" standards will be formulated by groups of experts under the aegis of the Conference of National Armaments Directors. In carrying out these responsibilities, it is recognised that it may be appropriate for one group of experts to formulate both kinds of standards applying in a specific field. In this event, the work will have to be carried out solely in a 15-country context.

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14. The North Atlantic Council may designate selected standardization objectives as "high priority".

15. Specific proposed standards may not be relevant to all Alliance nations. A proposed standard may be designated a "NATO Standard" if several (not necessarily all) Alliance nations agree that it is acceptable as a goal for implementation. Ratification of a NATO standard by a nation represents the appropriate commitment to national implementation of the standard within a reasonable time and as soon as the conditions for implementation are known.

16. Implementation of agreed NATO standards is a national responsibility. NATO strongly encourages implementation, in part administratively by observing, monitoring and reporting results on a nation-by-nation and case-by-case basis.

17. The effectiveness of the standardization process is greatly dependent upon the information available to support it. The need for a central source of information, including the status of all NATO standardization activities, NATO Standardization Agreements (STANAGs), Allied Publications and other forms of agreement to standardize, and an information interface with international standardization organizations is generally recognised. The information must be readily available to all users.

OPERATIONAL STANDARDIZATION

18. The maximum practicable "operational" standardization should be achieved as an essential prerequisite for inter-operability, which will ensure the effective combined employment of NATO forces. Priority of effort will be directed to achieve comprehensive NATO doctrine, tactics and procedures for Alliance forces in support of agreed concepts. If necessary this can be done on a regional basis. High priority will be given to the harmonization of those concepts, doctrines and mission needs which are considered essential to the effectiveness of future military missions. This applies especially when new technology provides emerging new operational capabilities which can be foreseen 15 to 20 years ahead(1).

MATERIEL STANDARDIZATION

19. Materiel standardization encompasses complete systems as well as sub-systems, and ACSM and consumables. Materiel standards may cover production codes of practice as well as all aspects of materiel specifications. Appropriate objectives for specific materiel standards therefore vary widely, depending on the class of materiel under consideration, and on whether a particular objective is primarily military, economic or technical in nature. When considering future complete materiel systems,

- 
- (1) Operational standardization of C3 systems includes primarily the development of operational and procedural interoperability standards.

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the military aspect may often be adequately met if systems procured by various Alliance nations are compatible or possess a specific degree of interoperability or interchangeability of components. Procurement of identical systems may have definite advantages for military or economic reasons. Such procurement will, however, often require a political decision(1).

20. In formulating and progressing proposals for increased materiel standardization, priority will be given to the development of valid estimates of the increased military effectiveness and/or economic savings associated with the proposal.

21. Industrial standards agreed by recognised international standardization bodies should be adopted for use within NATO without modification unless there are compelling reasons not to do so.

ADMINISTRATIVE STANDARDIZATION

22. Clear, precise and consistent use of terminology is essential for achieving intercommunication and understanding in a multi-lingual Alliance. The standardization of terminology is a necessary prerequisite for progressing both operational and materiel standardization. The use of terminology within NATO will be in accordance with the NATO Terminology Programme which designates French and English dictionaries as the basic source for definitions. If definitions of terms in the designated dictionaries are inadequate for general NATO use, these terms should be defined and submitted for possible inclusion in the NATO Glossary of Terms and Definitions, AAP-6, and used in accordance with the definitions therein. In these cases, first consideration will be given to the acceptance of definitions established by international bodies such as the United Nations, International Standardization Organization or International Electrotechnical Commission. In certain fields of standardization activity, it may be appropriate for experts to develop specialist lists of terms and definitions unique to their field. In these cases, terms already in general use within NATO will not be redefined to conform to specialist usage, and experts in one field should not expect that experts in other fields will necessarily accept special terminology.

23. Standardization in other administrative fields is encouraged whenever it facilitates co-operation or efficiency in the administration of Alliance activities. Administrative standards agreed by recognised international standardization bodies should be adopted for use within NATO without modification unless there are compelling reasons not to do so.

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(1) Materiel standardization of C3 systems primarily includes the development of technical interoperability standards.

N A T O U N C L A S S I F I E D



ANNEX to  
C-M(82)26

REGIONAL STANDARDIZATION CONSIDERATIONS

24. NATO-wide standardization, and standardization within smaller groups of NATO countries on a regional, economic or other basis, are complementary. Standardization by groups of NATO countries is better than no standardization at all. Hence regional standardization is encouraged when Alliance-wide standardization is neither necessary nor achievable. In some cases, military objectives for materiel standardization will apply only within regional groupings of nations, although wider standardization may be desirable for economic or political reasons.

IMPLEMENTATION .

25. General responsibilities and arrangements necessary to give effect to this document, will be published in a complementary North Atlantic Council document.

26. Specific internal implementing procedures and details should be published separately by the appropriate NATO bodies.

(Signed) V. GARBER  
Chairman

N A T O   U N C L A S S I F I E D

## CHAPTER 6 - NATO COMMAND RESPONSIBILITIES FOR LOGISTICS

It is generally sound to say that any commander should have the same control over the logistic forces and resources allocated to his use as he has over the combat forces allocated.

Henry E. Eccles<sup>1</sup>

Following an examination of logistic stocks at Chapter 4, it was concluded that in NATO's Central Region today, mobility is more important than the level of stocks.<sup>2</sup> It was emphasized that logistic mobility is linked to full control and enhanced interoperability between nations for Class V supplies and systems. The latter important aspects are discussed in the previous chapter; however, even under 'best case' conditions of logistic interoperability, the military requirements to exert effective command and control over battlefield resources remains paramount. This Chapter aims to examine NATO command responsibilities for logistics against the unsettling NATO dictum that 'logistics is a national responsibility';<sup>3</sup> but firstly it is necessary to briefly restate the military command chain for NATO's Central Europe land forces.

For the uniformed members of the Alliance the Military Committee, which meets at NATO Headquarters

Brussels, is the highest military authority in NATO. Its composition in peacetime is the Chief of Staffs of all the member countries in the integrated military structure of the Alliance, except Iceland.<sup>4</sup> The Chiefs of Staff meet at least twice yearly, or more frequently when "it is deemed necessary".<sup>5</sup> In order to provide effective continuity, its daily policy is undertaken by the nations permanent Military Representatives (MILREP's), who represent their country's Chiefs of Staff. It is to this Committee that the Major NATO Commanders are responsible, see the diagram only recently prepared by NATO Headquarters, at Figure 6.0.

The appointment of Supreme Allied Commander, Europe (SACEUR) is traditionally allocated to an American four star general, of which eight have followed in the footsteps of its first famous commander General Dwight D. Eisenhower.<sup>6</sup> He initially established the headquarters, the Supreme Headquarters Allied Powers Europe (SHAPE) in Paris on 2 April 1951;<sup>7</sup> but it moved to its present site in Mons, Belgium in March 1967 following the French decision to withdraw from the Allied integrated command structure.<sup>8</sup> The Mons location is now well established and is virtually a mini-city which, including all employees and dependants, comprises over 12,000 people.<sup>9</sup> An approximate breakdown by nations of personnel filling

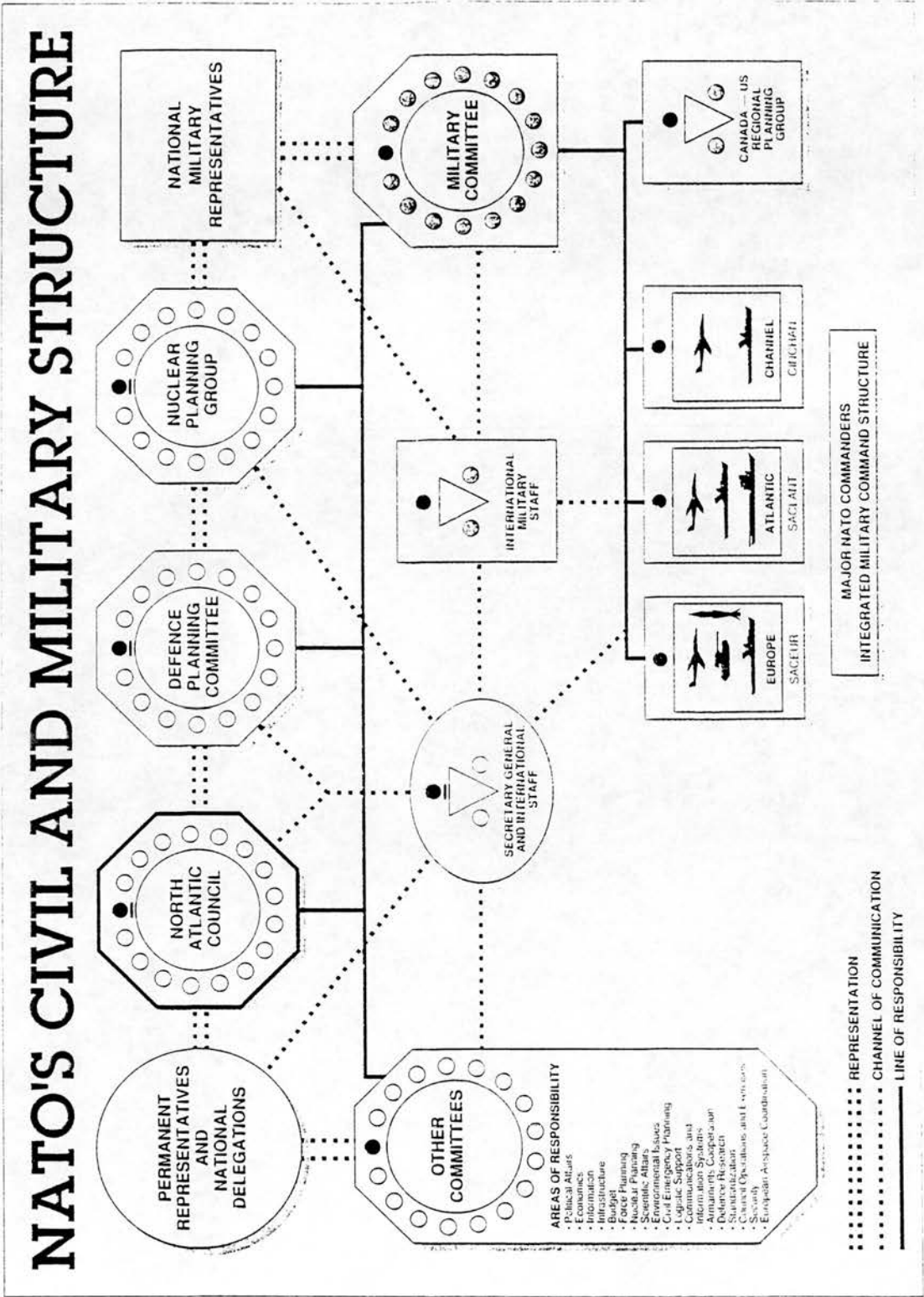


Figure 6.0

Source - NATO Information Service, Brussels November 1989

international staff appointments is: US - 31%, UK - 21%, GE - 16%, BE - 11%, IT and NL - 5%, other nations 2% or less.<sup>10</sup>

The current SACEUR is General John R. Galvin, and he commands a number of subordinate commands, see Figure 6.1. SACEUR effectively delegates operational command to his subordinate commanders as realistically SHAPE can only monitor conventional operations in wartime.<sup>11</sup> The two main tasks of SACEUR in crisis and war are: firstly, to initiate the request for full US reinforcement of Europe via NATO's Defence Planning Committee to the US President; secondly, to request nuclear release in time of war when necessary, by using the same chain of communications.<sup>12</sup> This latter action would only take place following a dire request from a Major Subordinate Commander (MSC), of which Commander Allied Forces Central Europe is one.

Allied Forces Central Europe has its headquarters in Brunssum, The Netherlands, within a former national coal mine complex. It is staffed by personnel of six nations<sup>13</sup> and is commanded by a German four star general known as Commander-in-Chief Central Europe (CINCENT). CINCENT has five Principle Subordinate Commands (PSC's) all in the Federal Republic of Germany: Northern Army Group (NORTHAG), commanded by a British



# Allied Command Europe

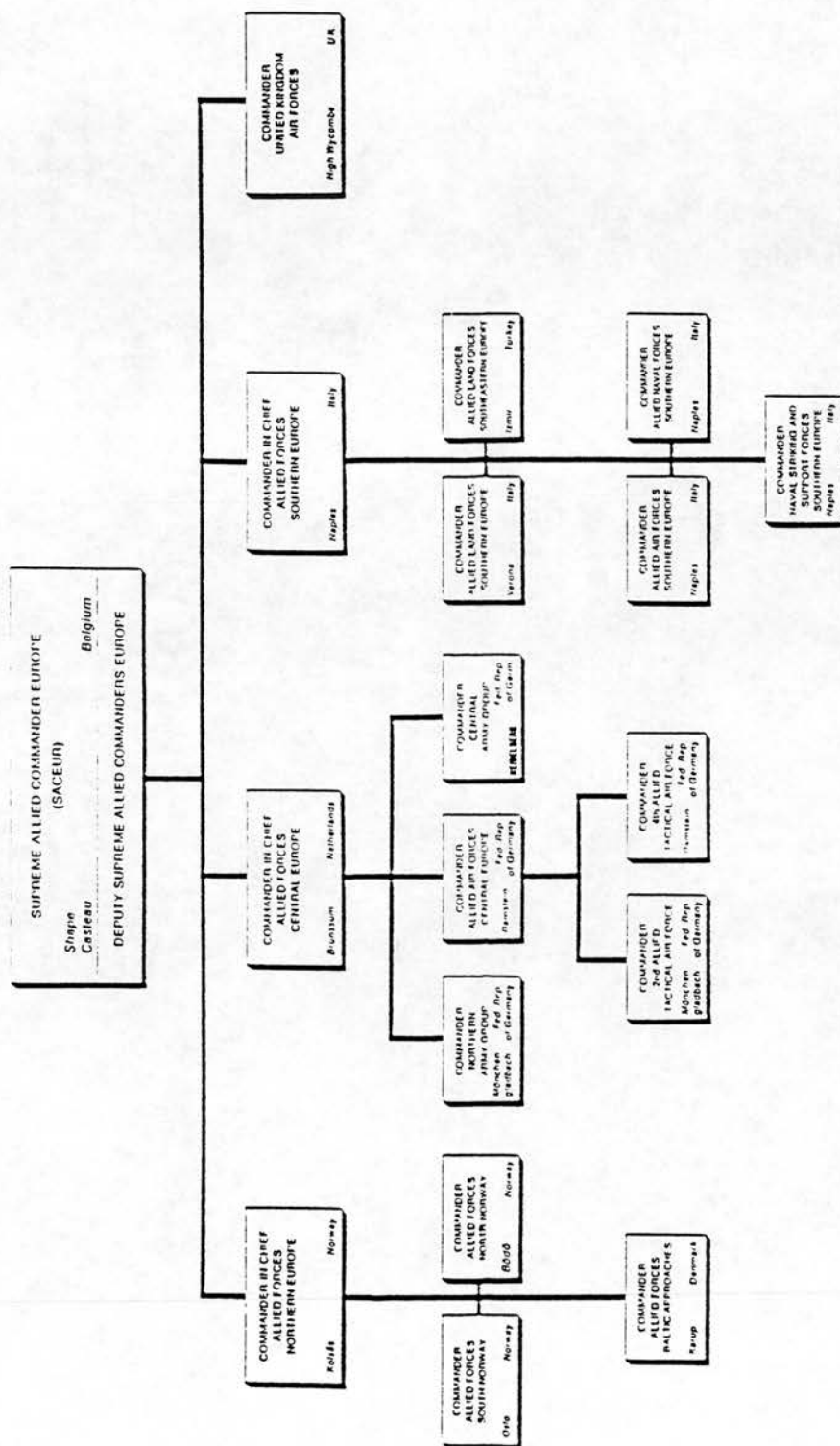


Figure 6.1

Source - NATO Information Service , Brussels 1984

general at Munchengladbach; Central Army Group (CENTAG), commanded by a US general at Heidelberg; Allied Air Forces Central Europe (AAFCE) commanded by a US general at Ramstein; and the Second and Fourth Allied Tactical Air Forces (ATAF's) that provide air support to NORTHAG and CENTAG respectively.<sup>14</sup>

The word command has been used several times in this Chapter; however, within the international NATO environment, the word implies different responsibility and authority meanings compared with a normal national perspective.<sup>15</sup> There are four terms currently used in NATO to describe command and control in the Alliance. They are:

Full Command is the military authority and responsibility of a superior officer to issue orders to subordinates and covers every aspect of military operations and administration. It exists only within national services.

The term "command" as used internationally implies a lesser degree of authority than when it is used in a purely national sense. It follows that no NATO commander has full command over the forces that are assigned to him. This is because nations, in assigning forces to NATO, assign only operational command or operational control.

Operational Command is the authority granted to a commander to assign missions or tasks to subordinate commanders, to deploy units, to reassign forces and to retain or delegate operational and/or tactical control as may be deemed necessary. It does not of itself include responsibility for administration or logistics. (It may also be used to denote the forces assigned to a commander).

Operational Control is the authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks which are usually limited by function, time or location; to deploy units concerned and to retain or assign tactical control of those units. It does not include authority to assign separate employment of components of the units concerned. Neither does it, of itself, include administration or logistic control.

Tactical Control is the detailed and, usually, local direction and control of movements or manoeuvres necessary to accomplish missions or tasks assigned.<sup>16</sup>

The military concept of full command which applies to national forces where the commander effectively exerts military authority over all subordinates,<sup>17</sup> is diluted within the international environment to the allocation of 'operational command' only. This designation meets the agreed requirement for individual nations to retain 'national responsibility' for the logistics of their NATO assigned forces. This principle is outlined in the North Atlantic Council Resolution of 23 February 1952, which states:

The responsibility for logistic support to national component forces will, in general, remain with the responsible authorities of the nations concerned. The responsibility for coordination will, however, rest with the Supreme Commander and with his major subordinate commanders at the appropriate levels.<sup>18</sup>

It is this Council Resolution that causes the imbal-

ance between responsibility (mission) of a NATO commander by limiting 'full command' to the less authoritative concept of 'operational command' as defined.

It is suggested that the 1952 Council Resolution to keep 'logistics a national responsibility' was probably due to three main influences. Firstly, the decision was made only seven years after the end of the Second World War when some Allied countries were frankly reluctant to surrender their national forces to full NATO command;<sup>19</sup> Secondly, the NATO management 37 years ago might not have been able to cope with the additional logistics responsibility; thirdly, the Allied force deployments were different from today's 'layer cake mix',<sup>20</sup> which sees five nations forces deployed in one comparatively small Army Group area.<sup>21</sup>

The North Atlantic Council of 1952 made good progress at a time when: one, Europe was only just beginning to recover from the effects of war, two, the Korean War was in progress the other side of the world; and three, the size of conventional Soviet Forces placed great emphasis upon the Allies nuclear deterrent.<sup>22</sup> However, in the intervening years NATO has expanded to include the Federal Republic of Germany, France has opted out of the Allied integrated military command, a strategy of flexible

response has been adopted, and greater emphasis is now placed upon mechanization and battlefield mobility. The military motivation to keep 'logistics purely national' is weakening, exemplified by this view:

It is a fundamental tenet of warfare that the provision of adequate logistic support is essential for success. It is equally fundamental that control and exercise of the logistic function cannot be divorced from operational command.<sup>23</sup>

The above comment by Air Chief Marshal Sir Ruthven Wade effectively damns the NATO definition of operational command, which "does not in itself include responsibility for administration or logistics";<sup>24</sup> and he is correct. For all the weight of NATO responsibility and office, a commander cannot command unless he also commands and controls logistic resources; without this ability a commander can only monitor and endeavour to coordinate.

\* \* \*

The North Atlantic Councils' 1952 Resolution<sup>24</sup> provides NATO's Supreme Commander and his major subordinate commanders the responsibility for 'coordination' of logistic support. The word coordinate is defined in Webster's Dictionary: "to regulate or combine in harmonious action",<sup>25</sup> and this description



would seem to fit the intention of the Councils' Resolution. However, NATO has an official definition of 'coordinating authority' which is a comprehensive combination of words, but it does not give an international commander the ability to compel agreement. NATO's coordinating authority is defined as:

The authority granted to a commander or individual assigned authority for coordinating specific functions or activities involving forces of two or more countries, of two or more services or two or more forces of the same service. He has the authority to require consultation between agencies involved or their representatives, but does not have the authority to compel agreements. In case of disagreement between the agencies involved, he should attempt to obtain essential agreement by discussion. In the event he is unable to obtain essential agreement, he shall refer the matter to the appointing authority.<sup>26</sup>

Within the above definition and guided by his terms of reference,<sup>27</sup> SACEUR has authority to establish requirements for nations logistic resources; but only in consultation with the national authorities. Similarly, he can 'determine' the geographic distribution of resources and can make recommendations concerning the quantity and quality of logistics to be held. The difficulty with all the words used to define a NATO commander's responsibility for logistics is that they do not offer true authority. The word coordination within the NATO forum has come to

mean consultation; however, as one distinguished American logistician noted over thirty years ago: "Responsibility for coordination must include authority to make decisions".<sup>28</sup>

At Supreme Allied Command Europe level the need to have a real coordinating authority is probably unnecessary. SACEUR's major war role can only involve monitoring the situation and, as already mentioned, being ready to recommend the use of and command nuclear weapons should they be employed. However, his major subordinate commanders do need the ability to make decisions concerning logistics which eludes them within the current NATO understanding of 'coordination'. The present sequence for Allied logistic policies and requirements are therefore that proposals are recommended by NATO commanders, agreed by national consensus within appropriate NATO committees, and are then coordinated by NATO commanders and finally implemented by nations.<sup>29</sup> This appropriate comment by Anthony Cordesman in his 1988 book about NATO's Central Region forces serves to emphasize the problem:

This decoupling of strategy and resources is probably the most consistent and most dangerous simple weakness in Western military thought.<sup>30</sup>

\* \* \*

While the foregoing section has made it clear that in effect a NATO commander has no real authoritative control over logistic resources, which remain firmly a national responsibility, it is foreseen that there may be times in a crisis of war that the situation makes it essential to transfer logistic resources from one nation to another in the interests of the cohesion of the Alliance. This transfer is termed 'reallocation of resources' and is defined in NATO:

The provision of logistic resources by the military forces of one nation from those deemed "made available" under the terms incorporated in appropriate NATO documents, to the military forces of another nation or nations as directed by the appropriate military authority.<sup>31</sup>

In order to assist the coordination and consultation of logistic requirements in crisis or war, each NATO command headquarters has established a logistics coordination centre or cell. These are made up of national military representatives and one of the missions of the Allied Command Europe Logistics Coordination Centre (ACE LCC) is to provide a link between Allied nations and SACEUR "so that his operational decisions can be consistent with logistic capabilities".<sup>32</sup> There is a similar logistic cell at AFCENT named the Multi-National Coordination Centre (MNCC) and each of its Army Groups have some form of logistic coordination centre for crisis and war.<sup>33</sup> An

important role of the ACE LCC is to maintain a list of national logistic surpluses or deficiencies - the former is sometimes ammunition 'made available' which is perhaps obsolescent, but may be of value to a nation still using the weapon.<sup>34</sup> However, reallocation of resources is subject to national voluntary agreements and is not the prerogative of the NATO commander.

Because there may be a need to transfer logistic resources in a war emergency, which would be especially applicable to the Central Region due to the international mix of corps, NATO has officially defined the term 'reallocation authority' as:

The authority given to NATO commanders and normally negotiated in peacetime, to reallocate in "an emergency in war" national logistic resources controlled by the combat forces under their command, and made available by nations, in order to influence the battle logistically.<sup>35</sup>

The ability to reallocate national logistic resources 'controlled by the forces under their command' ties NATO commanders to those resources 'made available by nations' and is linked to an emergency in war. This situation is limited in its duration (applicable for only a short period) and an emergency in war is defined as:

An operational contingency in a limited

area caused by a critical aggravation of combat operations and requiring special and immediate action by National and Allied Commanders. The existence of such an emergency shall be determined by the Allied Commander responsible for the limited area involved, in consultation with the National Commander concerned.<sup>36</sup>

A careful examination of the NATO definitions used in connection with the reallocation of national logistic resources shows that the whip hand remains, at all times, with the national commander and owner of the stocks. A NATO commander has no real authority or responsibility to direct a national commander to transfer his stocks to another nation, even in a war emergency.<sup>37</sup>

\* \* \*

...good combat leaders cannot ignore the resupply and administrative functions. And to really get these functions to operate well, you can do it only from the front.

General Hermann Balck<sup>38</sup>

The General who, commanding the 48th Panzer Corps in the Second World War which was responsible for "the virtual destruction of 3 Russian armies",<sup>39</sup> would doubtless be perplexed with today's NATO commanders inability to exert full control over the logistic resources of assigned troops. A fellow



countryman General Hans Speidel is quoted by James A. Huston in his book One for All, as saying "logistics as a national responsibility does not make any military sense";<sup>40</sup> and this view is becoming more widespread in NATO international military circles.<sup>41</sup>

The logistic constraints which affect NATO commanders are most certainly not applicable to commanders in the Warsaw Pact forces who, on the basis of their countries' historical experience, ensure that full command (within NATO definition) is applicable to their field commanders. An objective analysis by the American Graham H. Turbiville, Jr., who specializes in Soviet Forces Logistics has noted that:

It was a basic conclusion from that Second World War that each level of command must possess its own rear service resources. That is, rear service reserves must be established at every level to permit, as one Soviet author put it, "the appropriate command to influence the course of events in time, and maintain the viability of the system of rear support to the army in the field".<sup>42</sup>

The aim of NATO should be to ensure that its commanders have full control and responsibility of logistics 'at the right level' so that they too can influence the course of the battle and not just monitor events, for without control of logistics there can be no real command responsibility.

### POSTSCRIPT

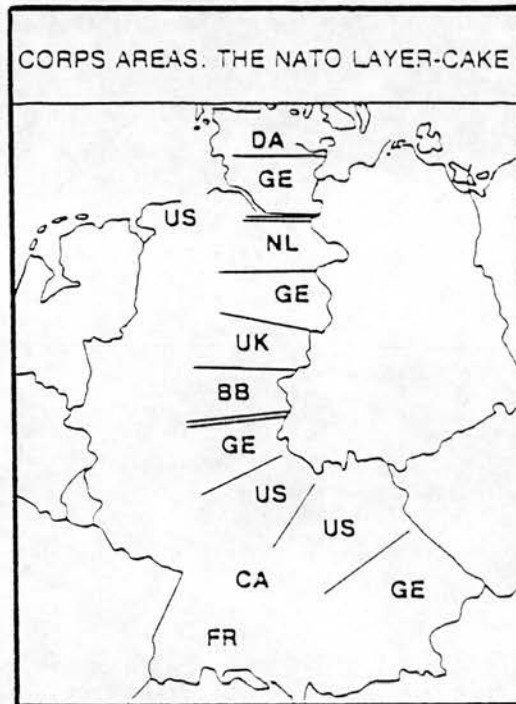
Noting that while member governments, in assigning national forces to NATO Command, have entrusted the lives of their soldiers to allied commanders, they have not transferred sufficient control over materials, to enable these commanders to employ their forces effectively.<sup>43</sup>

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## NOTES - CHAPTER 6

1. Henry E. Eccles, Military Concepts and Philosophy (Rahway, New Jersey, 1965), p.100.
2. See Chapter 4, Note 189.
3. Unsettling because it conflicts with the old military maxim that 'administration cannot be divorced from command'.
4. Iceland, having no military forces, may be represented by a civilian - NATO Logistics Handbook (Brussels, 1989), p.4.
5. NATO Handbook (Brussels, 1986), p.35.
6. The Generals who followed Eisenhower were: Ridgway, Gruenther, Norstad, Lemnitzer, Goodpaster, Haig, Jr., Rogers, and Galvin.
7. Temporarily in the former Hotel Astoria, on the South side of the Avenue des Champs Elysees; but shortly afterwards SHAPE moved to more permanent accommodation at Rocquencourt.
8. President de Gaulle announced France's intention to withdraw from the integrated military structure on 10 March 1966, see NATO Facts and Figures (Brussels, 1984), p.343.
9. SHAPE Public Information Office, 1989.
10. Ibid.
11. This represents the author's fair, but experienced judgement.
12. See David M. Abshire, Preventing World War III: A Realistic Ground Strategy (New York, 1988), p.27 and in particular, Note 4.
13. BE, CA, GE, NL, UK and US.
14. NATO Facts and Figures (Brussels, 1984), pp.106-108.
15. Command: "to have authority over or control of". Concise Oxford Dictionary.
16. NATO Logistics Handbook (Brussels, 1989), pp.7-8.
17. In the British Army military discipline is upheld by Act of Parliament.

18. North Atlantic Council Resolution of 23 February 1952, see NATO Logistics Handbook (Brussels, 1989), pp.25-26.
19. A far greater suspicion of foreign armies existed in those early days of the Alliance. (Author's Notes).
20. Layer-cake mix:



(Source: David Greenwood, "Towards Role specialization in NATO), NATO's Sixteen Nations (July 1986), p.46).

21. The Northern Army Group (NORTHAG).
22. It was in 1953 that the US began deploying tactical nuclear weapons to Europe. See Karsten Voigt, Rapporteur Sub-Committee on Conventional Defence in Europe, North Atlantic Assembly Paper Conventional Defence in Europe (Brussels, 1985), p.4.
23. Sir Ruthven Wade, "Defence Logistics: Evolution or Revolution?", Brassey's Defence Yearbook (London, 1978/9), p.142.
24. See NATO Logistics Handbook (Brussels, 1989), pp.25-26.
25. Henry E. Eccles, Logistics in the National

- Defense (Harrisburg, Pennsylvania, 1959), p.252.
26. NATO Glossary of Terms and Definitions AAP-6.
27. NATO Document MC53/1 (Final) 1979 - SACEUR's Terms of Reference.
28. Henry E. Eccles, Logistics in the National Defense (Harrisburg, Pennsylvania, 1959), p.252.
29. See NATO Logistics Handbook (Brussels, 1989), p.26.
30. Anthony H. Cordesman, NATO's Central Region Forces: Capabilities, Challenges, Concepts (London, 1988), p.xxii.
31. NATO Glossary of Terms and Definitions AAP-6.
32. NATO Logistics Handbook (Brussels, 1989), p.44.
33. Ibid, p.45.
34. Ibid, p.142.
35. Ibid, p.151.
36. Ibid, p.148.
37. This area was discussed with NATO's Director of Logistics, Major General Homer D. Smith at NATO Headquarters Brussels on 21 January 1987 who identified this as a serious problem - author's notes.
38. General Hermann Balck, translation of taped conversation 12 January 1979 by Battelle Columbus Laboratories, Tactical Technology Center (Columbus, Ohio, 1979), MIPR No. FY 7615-78-05106, p.49.
39. Ibid, Biographical Sketch, pp.3-4.
40. James A. Huston, One for All (Newark, Delaware, 1984), p.289. Author's observations following informal visits to military headquarters in Belgium, The Netherlands and the Federal Republic of Germany.
41. Graham H. Turbiville, Jr., "Sustaining Theater Strategic Operations", The Journal of Soviet Military Studies (April 1988), p.83.
42. From a draft recommendation by the WEU Committee on Defence Questions and Armaments, "State of



European Security: Logistics in Allied Forces  
Central Europe", Western European Union  
Document 180, dated 25 October 1960, Appendix.

## CHAPTER 7

### OBSERVATIONS AND EXTRAPOLATIONS: SOME PRELIMINARY CONCLUSIONS

...it must constantly be borne in mind  
that neither logistics, nor strategy,  
nor tactics operates alone.

Hawthorne Daniel<sup>1</sup>

At the beginning of this study, attention was drawn to the inter-relationship between strategy, tactics and logistics, not only within academic defence studies, but also on the battlefield. For logistics is a practical subject which involves management of resources which could have a direct influence upon life or death of one's own troops in war. Because of its supreme importance to fighting troops, logistics as a subject can be as exacting as it is vital. It involves the application of sound management in its truest sense and it offers the rewards of contributing to team work which characterizes the military culture in both peace and war. Past successes or failures on the battlefield are mainly attributed to a military commander's strategic or tactical plan and often neglects logistic considerations. But analysis of engagements frequently shows that it was the presence or lack of essential logistic supplies which really swayed the outcome. Examples abound, but in keeping with the international nature of this

study, it could be argued that the country leading today's Western Alliance only came into being as a nation due to the inadequacy of a transport system carrying vital combat supplies to troops. It is widely recognized that Burgoyne's surrender of his 5,763 men at Saratoga in 1777 stiffened the French alliance and marked the turning point of the American Revolution. The British defeat resulted primarily from inadequate transport to cover a particularly difficult 16 miles overland stretch between Lake George and the Hudson River;<sup>2</sup> thus it is advanced that US Independence was swayed in no small measure by the influence of logistics on the battlefield.

\* \* \*

It is the influence of logistics upon a European battlefield and the sustainability of today's fighting troops, which resulted in the choice of 'NATO Logistics Policy (Central Region)' as an area for academic study. In Chapter 1 it is explained that the original Western European Union agreement that 'logistics is a national responsibility' permitted Allied nations a degree of latitude and resulted in:

- Different national battlefield logistic management systems.
- Different national stock-levels.

- Differences in logistics interoperability.
- The lack of authority for a NATO commander to control logistic assets.

It is emphasised that this stance has impacted upon the duration a conventional defence could be maintained, and it has effectively kept the nuclear threshold low. Furthermore, it is suggested that immediate improvements are not likely due to four main factors: first, a public perception of an easing of the Soviet threat; second, the continuing growth of West European peace movements; third, an impression gained by many Western publics that NATO forces could defeat a conventional attack; and fourth, a genuine desire to see finite national funds spent on peacetime projects such as health, education and conservation. However, the reality is that today (1989) there is insufficient logistic support providing inadequate sustainability for the troops assigned to NATO command in war.

Chapter 1 notes that the geographic area for the study - NATO's Central Region was chosen essentially for three main reasons. Firstly, Britain has committed substantial land and air forces to the region on the basis that the forward defence of Europe represents the forward defence of UK itself;<sup>3</sup> also, for British taxpayers (thus stakeholders) it is signifi-

cant that over 40% of the country's total defence budget supports this deployment. Secondly, the unique international mix of Allied nations forces stationed side by side, in a comparatively limited area and, as mentioned above with each operating different national battlefield logistic systems, offers a complex and challenging study topic. Thirdly, the region is arguably the most important part of NATO's defensive posture; providing military, industrial and economic resources as part of the Western Alliance and as part of the European Economic Community. To re-emphasise the criteria of the study, the subject area 'military logistics' narrows down the focus to land force logistics and the geographic bounds of the thesis lie within Central Europe where the United Kingdom, together with the United States, provides its major support. Two parameters or limitations outlined in Chapter 1 concerns the special relationship of France being part of NATO, but not part of the integrated military structure, and the influence of European versus American industry. Both these areas have been considered but excluded to save clouding the basic problem.

Chapter 2 touches upon the changing political scene in Europe which has been described by the US President as being "in a state of flux".<sup>4</sup> A



chronology of recent events draws attention to the INF Treaty which led to increased emphasis being placed upon the conventional leg of NATO's triad of deterrence. It is noted that this area of conventional weakness resulted in a Conventional Defence Improvement initiative launched by NATO some two years before the INF agreement. The problems of the expense of conventional improvements, at a time of declining defence budgets, does not auger well for substantial investments by NATO nations. An Allied approach to arms control and disarmament in the CFE negotiations may result in future conventional force reductions, and ease the twin problems of: (a), a preponderance of Warsaw Pact military might; and (b), the cost penalties of enhancing NATO's conventional deterrent.

In Chapter 3 the varying systems of battlefield logistic management are assessed. It is noted that while there is a general similarity between the various methods used; the UK is out of step with its immediate Allies. "The British Army is alone amongst the NATO forces in AFCENT and the Warsaw Pact in not providing brigades with logistic support".<sup>5</sup> This situation has developed over time and British Battlegroups now do not have sufficient transport "to carry their first line support or to effect their own re-supply".<sup>6</sup> The lessons of Saratoga are, alas,

long forgotten. The planned introduction of logistic handling equipment (DROPS) should reduce battle-field transport turnaround times and help to redress the transport lift shortfalls; however, one senior officer has warned that "DROPS is not a panacea".<sup>7</sup> In the wider context of NATO's logistic management systems, a former Commander Northern Army Group has recommended more integration of defence resources with these words:

We could create a single NATO logistic system. At the moment we have seven national Lines of Communication weaving their way cross Europe and duplicating each other. Army Group Commanders have very little control over their rear areas or logistics which is a serious weakness.<sup>8</sup>

The sensitive subject of NATO logistic stock-levels and burden-sharing pressures is outlined in Chapter 4. The lack of sustainability mentioned by several NATO military leaders, including the former SACEUR could easily be transposed to read 'lack of ammunition stocks', for it is here that the situation is most serious. A shortfall of sufficient conventional ammunition could well force NATO to implement the second leg of its triad of deterrence - theatre nuclear weapons - much sooner than prudence would dictate; but this situation is not new. A policy was made in the earlier days of the Alliance that nations should stock sufficient

ammunition for their forces to conduct defensive operations until such time that re-supply could commence from 'surged' industrial ammunition production - a logical plan. At the time NATO planners assessed this would require 90 days and surprisingly, the Russians made a similar appreciation and determined the same figure (in fact 3 months). Due to a number of factors discussed in Chapter 4, NATO amended the 90 days to an 'interim' target of not less than 30 days, with an implicit proviso that nations should be ready to gear-up industrial production to surge rates certainly much faster than the original 90 days plan. It is quite clear that, with the exception of the US, nations are nowhere near meeting the agreed 'interim' goal. In addition, the Western ammunition production base is rapidly declining to the extent that it could not now even meet the initial 90 day demands to surge production. A final complication is that the planning guidance produced by SHAPE concerning daily ammunition expenditure rates per weapon system is considered, by some, to be low for various categories of ammunition. The stocks of conventional munitions held by the European members of the Alliance, varies between only hours in double figures and days in single figures to the low teens depending upon the intensity criteria used; but in any event, the figures all fall short of the basic interim measures agreed by nations. In contrast,

the Soviet Union has retained its 3 month figure and all the indications are that the State has met these requirements with 90-100 day stocks positioned forward in their Western Theatre of Military Operations which faces NATO's Central Region. It is the quantity and location of these stocks which have generated unease publicly expressed by General John R. Galvin, the Supreme Allied Commander Europe.

It is against this background where the INF agreement has placed greater reliance upon conventional forces that America is pressing its Allies to do more within the burden-sharing debate. Conventional ammunition and fuel is expensive and nations are frankly reluctant to set aside the necessary funds. In Chapter 4 it is emphasised that the major impetus for Allies to take more share of the collective burden stems from US political initiatives rather than true objective judgement. Nevertheless, given the state of Allied sustainability on the battlefield, the American concern is understandable. Difficulties of a different nature are covered in Chapter 5, where NATO interoperability is discussed in detail. The problem is that standardization and interoperability is voluntary within NATO and in consequence, progress is far too slow. Key committees at best meet annually and its work is hampered by the 'voluntary principle'. There are severe difficulties, not only concerning

the interoperability of different national weapons and equipments; but also in procedures. The latter aspect is serious as efficiency could be enhanced by standardizing methodology at virtually no cost to the nations, but it is disappointing to record so little progress for an Alliance 40 years old at the time of writing. A graver concern is reserved for a NATO commander who, as outlined in Chapter 6 , has no effective control over the logistic resources of the troops placed under his command.

\* \* \*

It was mentioned at the beginning of this Chapter that logistics is a practical subject which involves the management of resources which could have a direct influence upon the life or death of one's own troops in war. The most serious shortfall in NATO logistics policy in the Central Region concerns a shortage of ammunition stocks against the sure knowledge that some Allied Corps sectors would face a greater enemy pressure than others. The level of defence is not even, as it must respond to the pressure points created by the aggressor's initiative. Yet, when resources are so limited, it is a nonsense to spread finite stocks across the region under the cloak of 'national responsibility'. As the aim is to maintain an effective conventional defence as long as



possible - then some innovative management of resources is essential. This aspect is discussed in Chapter 4, where a feasible solution involves centralizing the greater proportion of national logistic stocks under a NATO commander's control; but decentralizing transport resources to provide mobility. The importance of mobility is stressed as being a key; but the centralization of ammunition requires a degree of standardization or interoperability (as defined in Chapter 5), linked to effective control. There is a precedent for this type of resource management as the allocation of fuel to Central Region NATO Corps and air bases is coordinated at joint Army Group/Allied Tactical Air Force level under the overall command of AFCENT. These resources are firmly managed to ensure that priority is given on the basis of the NATO commander's plan and the developing tactical situation. The template is available for this management methodology to also embrace ammunition. If adopted, it would allow the Central Region Army Groups to extend the duration of their conventional operations. At the battlefield level, the scheme requires mobility and control of logistics 'at the right levels'; but this is achievable at less cost than stockpiling to the agreed scale, even if national funds were available. In other words, thirty days of ammunition held by all Central Region Allied nations would provide thirty plus days sustainability if the resources were managed

at NATO level.

The fundamental logistic weaknesses which have been discussed can be traced to the 1952 decision that 'logistics is a national responsibility'. This has been enhanced by national interests to keep logistics national for both political and economic considerations. This latter point is assisted by national annual defence and budget cycles which permit logistic stock purchasing to be used to balance accounts. It is easier to cut a fuel or ammunition purchase when under economic pressure than to cancel a longstanding equipment project with its many political-military implications. Such logistic cuts can remain 'under the counter' for significant periods and a move to centralize the coordination of national ammunition on a NATO basis may not find immediate favour with all nations; but times are swiftly changing.

The INF agreement of 1987 has placed a greater emphasis upon the conventional leg of NATO's triad of deterrence; but possible future cuts of conventional forces in Central Europe through the CFE talks, see Chapter 2 Appendix B, will have a further impact upon NATO forces. In a post-reduction environment, the cuts in conventional force strengths paradoxically increases the sustainability of the remaining

Soviet forces creating an even greater logistic imbalance that exists at present. It is a concern which should spur the NATO alliance to enhance its own force sustainability as a matter of urgency. The timing may now be right for national implications of battlefield logistics to be set aside in the interests of adopting effective methods of resource management.

\* \* \*

In many things the best solutions to problems are very often the simplest. This thesis therefore ends with five specific points or pointers which it is concluded would improve NATO's logistic posture in the Central Region of Europe today:

- First, the adoption by nations of similar battlefield logistic management systems to enhance flexibility and operational cross-corps support in times of war.
- Second, a national agreement for a specific quantity of Class V supplies to be held under AFCENT command with control of allocation devolved to Army Groups to increase Allied 'sustainability'. This can be achieved by ensuring that ammunition is

available where it is most required and not spread thinly across the Central Region.

- Third, an agreement by nations to introduce a three year budget cycle for the funding of defence materiel, and to provide accurate reports of logistic stock-levels at each level of NATO command.
- Fourth, NATO should re-define the 'logistics is a national responsibility' agreement at its highest decision-making level to ensure that a NATO commander is mandated to control consumer logistic resources of all the forces placed under his command.
- Fifth, NATO should amend the 'voluntary' principle of standardization where it applies to interoperability of:
  - Command and control systems and procedures.
  - Ammunition for common weapons systems.

The above quite simple measures comprise three conclusions for nations and two conclusions for NATO. The aim is to improve the logistic sustainability of Allied conventional forces as a means of raising the nuclear threshold through the maintenance of fighting power. This can be achieved by implementing the five

conclusions of this study; where it is emphasized that, in defensive operations today, mobility and control of logistics at the right level is essential for battlefield success.

This paper represents a substantial contribution to the subject knowledge of NATO military logistics policy and systems and is based upon many years of logistic experience reinforced by international level research. Strategy, tactics, management systems and economics are all important in the NATO environment. However, in the final analysis it is man, not functions who make things happen and really matter. The Allies' best resources are its soldiers. They must be supported wisely and well.

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## NOTES - CHAPTER 7

1. Hawthorne Daniel, For Want of a Nail: The Influence of Logistics on War (New York, 1948), p.xiv-xv.
2. Ibid, p.53.
3. British Defence Policy 1988-89 (London, 1988), p.21.
4. President George Bush, speech "Afternoon intervention on the Future of Europe", delivered at NATO Headquarters, Brussels on 4 December 1989 - author's notes.
5. Colonel M.A. Gilbertson, "The development of Logistics in the British Army", in J.J.G. MacKenzie and Brian Holden Reid, eds., The British Army and the Operational level of War (London, 1989), p.87.
6. Ibid, p.85.
7. UK's Director of Movements (Army), Brigadier G.E. Bartlett made this puckish addition to the comment "it merely provides the ability to place a greater quantity of kit in the wrong place". Interview conducted by the author on 3 October 1989.
8. General Sir Martin Farndale, "The Operational level of Command", RUSI Journal (Autumn 1988), p.28.

## GLOSSARY OF ABBREVIATIONS

AAFCE	Allied Air Forces Central Europe
AAP	Allied Administrative Publication
ACE	Allied Command Europe, the area commanded by SACEUR
AFCENT	Allied Forces Central Europe
AFNORTH	Allied Forces - Northern Europe
AFSOUTH	Allied Forces - Southern Europe
ATAF	Allied Tactical Air Force
BAOR	British Army of the Rhine
BAS	Battle Attrition Study
CDI	Conventional Defence Improvements
CENTAG	Central Army Group
CEOA	Central Europe Operating Agency
CEPS	Central Europe Pipeline System
CINCENT	Commander-in-Chief Allied Forces Central Europe
CINCHAN	Commander-in-Chief Channel
COMMZ	Communication Zone
COS	Chief of Staff
C. Sups	Combat Supplies
CZ	Combat Zone
DAER	Daily Ammunition Expenditure Rate
DCOS	Deputy Chief of Staff
DOS	Days of Supply
DPC	Defence Planning Committee
DPQ	Defence Planning Questionnaire; a series of questions put to nations by NATO Headquarters to assess their military capabilities and planning

DROPS	Demountable Rack Offloading and Pickup Systems
EUROGROUP	Group of European NATO Members
EUROLOG	EUROGROUP Logistic Sub-Group
EWG	Executive Working Group
FCU	Fuel Consumption Unit
FCZ	Forward Combat Zone
FEBA	Forward Edge of the Battle Area
FLOT	Forward Line Own Troops
FOUR ATAF	4 ATAF/Fourth Allied Tactical Air Force.
GDP	General Defence Plan/Gross Domestic Product
GLCM	Ground Launched Cruise Missile
GNP	Gross National Product
GTNC	German Territorial Northern Command
GTSC	German Territorial Southern Command
HNS	Host Nation Support
IGB	Inner German Border
IMS	International Military Staff; the staff at NATO Headquarters which supports the Military Committee
INF	Intermediate Nuclear Forces
IPC	Industrial Planning Committee
IS	International Staff; the staff at NATO Headquarters which supports the North Atlantic Council
JOC	Joint Operations Centre
LCC	Logistic Co-ordination Centre
LOC	Lines of Communications; a general term covering the land and sea routes to be covered before a force arrives at its war location

MAS	Military Agency for Standardization
MC	Military Committee
MILREP	Military Representative to the Military Committee
MLRS	Multiple Launch Rocket System
MNC	Major NATO Commander; i.e., SACEUR, SACLANT, DINCHAN (see also MSCs and PSCs)
MNCC	Multi-National Co-ordination Centre (at AFCENT)
MOB	Main Operating Base; a major military airfield
MOD	Ministry of Defence
MOU	Memorandum of Understanding; an agreement, covering such matters as Host Nation Support, often made between Ministries of Defence of two or more nations
MSC	Major Subordinate Commander
MSR	Main Supply Route
NAA	North Atlantic Assembly
NAC	North Atlantic council
NAMSA/NAMSO	NATO Maintenance and Supply Agency/Organization
NICS	NATO Integrated Communications System
NMASs	NATO Military Authorities
NORTHAG	Northern Army Group
NPC	NATO Pipeline Committee
NSWP	Non-Soviet Warsaw Pact
NWOO	Nato Wartime Oil Organization
PERMREP	(National) Permanent Representatives to the North Atlantic Council
POL	Petroleum, Oils and Lubricants
PSC	Principal Subordinate Commander

QMG	Quarter-Master-General (of the Army)
RAMC	Royal Army Medical Corps
RAOC	Royal Army Ordnance Corps
RARS	Review of Ammunition and Related Scales
RCT	Royal Corps of Transport
RCZ	Rear Combat Zone
REME	Royal Electrical and Mechanical Engineers
SACEUR	Supreme Allied Commander Europe
SACLANT	Supreme Allied Commander Atlantic
SCEPC	Senior Civil Emergency Planning Committee
SHAPE	Supreme Headquarters Allied Powers Europe
SHORAD	Short Range Air Defence weapons/missile systems etc
SNLC	Senior NATO Logisticians' Conference; the senior NATO advisory body on consumer logistics, consisting of both civil and military members
STANAG	Standardization Agreement (NATO)
STC	SHAPE Technical Centre
TWO ATAF	2 ATAF/Second Allied Tactical Air Force
UKMF	United Kingdom Mobile Force
USAFE	United States Air Force (in) Europe
USAREUR	United States Army (in) Europe
WEU	Western European Union
WG	Working Group
WP	Warsaw Pact/Working Paper (in NATO)



## SELECT BIBLIOGRAPHY

### Bibliographical Notes

The bibliography aims to provide a specific and singular contribution to the subject knowledge of this particular discipline and is arranged in five sections to assist identification of the sources and methods used. It is noted on page 1 of the main text that there are 'few books on logistics' in comparison to those on strategy and tactics and research has proved this view to be correct. However, the three elements: strategy, tactics and logistics are totally interdependent and this relationship is reflected within the bibliography; but the main emphasis is properly placed upon the broad spectrum of military logistic studies and management.

Section I comprises essential 'foundation' research material of a unique and particular nature. It is divided into three sub-sections: (a) specific documentation including original NATO policy references for which, in general terms, there is "no direct access" due either to a security classification or to confidentiality; (b) material with a limited availability which had to be unearthed through a degree of investigative perseverance; and (c) a record of the unique interviews/discussions conducted with key personnel,

spanning several countries, during the tenure of the study. The resulting materials from these important discussions, which included attendance as an observer at a Senior NATO Logisticians Conference are held under cover of personal and in some instances NATO confidentiality; but each provided valuable signposts and support for this academic defence logistics research. It is considered that the information listed in Section I and in particular, in sub-sections (a) and (c), corresponds to primary source material.

Section II records reports, studies and research papers relevant to the study, including the committee reports of the North Atlantic Assembly in Brussels who provided direct assistance. The Special Report NATO in the 1990s is of particular significance. Section III contains a list of contemporary articles which also represent a vital area of research for a topic where the emphasis is very much placed upon the present - the European battlefield of today - a truly dynamic situation.

Section IV lists a number of important yearbooks, handbooks and annual reports which includes UK's Statement on the Defence Estimates, annual threat assessment publications and, in view of Western Europe's steady advance to the single market of 1992, some data from the European Communities. The

final Section V does indeed list some of the valuable 'few books on logistics', but is augmented by monographs, not only from the strategy/tactics arena, but also from the field of management science. This latter aspect is important, for logistic support on the battlefield of the 1990s will require significant resource management where the focus must be placed upon management.

The bibliography is structured as follows:

SECTION I - Primary Source Material:

- (a) Guideline Material - No Direct Access.
- (b) Material - Limited Availability.
- (c) Interviews/Discussions.

SECTION II - Reports, Studies and Research Papers.

SECTION III - Articles.

SECTION IV - Yearbooks, Handbooks and Annual Reports.

SECTION V - Select Monographs.

## SECTION I

### (a) Guideline Material - No Direct Access

Alstead, F.A.L., The Reinforcement of Central Europe in Crisis and War. Brussels; NATO Headquarters Directorate of Logistics, 1989.

Blandy, C.W., Notes on Soviet Artillery Ammunition Norms for Counter Bombardment and Neutralisation of Strong Points. Salisbury, Wiltshire; United Kingdom Commanders-in-Chief Committee, 18 July 1984.

de Maizière, Ulrich, Rational deployment of forces on the Central Front. Paris; Western European Union Assembly Document 663, 2 April 1975.

Dijkstra, C.J., Collective logistical support. Paris; Western European Union Assembly Document 966, 20 December 1983.

EUROLOG Army Sub Group, Study of a model system of ammunition supply. Aldershot, The Training and Logistic Development Team RCT, November 1987.

NATO document, MC 14/2 (Revised). NATO Strategy, 1956.

NATO document, MC 55/1. Military Planning Factors, 1958 with Appendix B revised in 1963.

NATO document, MC 86 (Final). Logistic resources to be made available to ACE in the event of an emergency in war, 1958.

NATO document, MC 36/2 (Revised). Division of responsibility in wartime between national commanders and Major Subordinate Allied Commanders, 1960.

NATO document, MC 14/3. Flexible Response Strategy, 1967.

NATO document, MC 55/2. Military Planning Factors, 1973.

NATO document, MC 53/1. SACEUR's Terms of Reference, 1976.

NATO document, AC/305-DS/1 Annex I. Opening address by the Secretary General to the first Senior NATO Logisticians Conference, 1976.

NATO document, C-M (82) 26. Principles of NATO

Standardization, 1982.

NATO document, MC 20/8 (Final). The Military Committee Policy on Standardization, 1984.

NATO document, AC/12-WP/166, Annex I, II & III. Aide Memoire on aviation, ground and naval fuels in NATO, 1984.

NATO document, MC 299. Conceptional Military Framework, 1985.

NATO Military Agency for Standardization (MAS) document MAS (ARMY) 695-1/AMMO (TOR), Terms of Reference for the Land forces Ammunition Interchangeability Working Party. Brussels; 30 December 1985.

NATO MAS document MAS (ARMY) 219-1/LOG, Report to the Army Board of the 12th Meeting of the Land Force Logistics Working Party. Brussels; 19 March 1986.

NATO Military Agency for Standardization document MAS (ARMY) 362-1/AMMO, Report to the Army Board of the 16th Meeting of the Land Forces Ammunition Interchangeability Working Party. Brussels; 29 May 1986.

NATO document DS/STAN-2, List of Standardization Agreements (STANAGs) and Allied Publications (APs) sponsored by the Defence Support Division. Brussels; September 1986.

NATO Military Agency for Standardization document MAS (ARMY) 660-1/F&L, Report to the Army Board of the 32nd Meeting of the Army Fuels and Lubricants Working Party. Brussels; 15 October 1986.

NATO Military Agency for Standardization document MAS (ARMY) 757-1/F&L, Terms of Reference for the Army Fuels and Lubricants Working Party. Brussels; 24 November 1986.

NATO Military Agency for Standardization document MAS (ARMY) 653-1/LOG (TOR), Terms of Reference for the Land Forces Logistic Doctrine Working Party. Brussels; 6 January 1987.

NATO Military Agency for Standardization document MAS (ARMY) 083-1/LOG, Report to the Army Board of the 13th Meeting of the Land Forces Logistic Doctrine Working Party. Brussels; 26 March 1987.

NATO Military Agency for Standardization document MAS (ARMY) 245-1/AMMO, Report to the Army Board



of the 17th Meeting of the Land Forces Ammunition Working Party. Brussels; 15 June 1987.

NATO Military Agency for Standardization document MAS (ARMY) 305-1/F&L, Report to the Army Board of the 33rd Meeting of the Army Fuels and Lubricants Working Party. Brussels; 15 July 1987.

NATO document PO/87/77, Procedures for NATO Conventional Armaments Planning. Brussels; 13 October 1987.

NATO document AC/315-d/15, NATO Standardization Group (NSG). The NSG Compendium. Brussels; 22 February 1988.

NATO Military Agency for Standardization document MAS (ARMY) 254-1/LOG, Report to the Army Board of the 14th Meeting of the Land Forces Logistic Doctrine Working Party. Brussels; 15 June 1988.

NATO Military Agency for Standardization document MAS (ARMY) 409-1/BR (TOR), Terms of Reference for the Land Forces Battlefield Recovery and Repair Working Party. Brussels; 17 November 1988.

NATO Military Agency for Standardization document MAS (ARMY) 506-1/AMMO, Report to the Army Board of the 18th Meeting of the Land Forces Ammunition Working Party. Brussels; 30 November 1988.

NATO document Annex to AC/112 (WG/4) WP/38 (Revised), The Single Fuel Concept (SFC). Brussels; 20 February 1989.

NATO Military Agency for Standardization document MAS (ARMY) 143-1/HIS, Report to the Army Board of the 12th Meeting of the Helicopter Interservice Working Party. Brussels; 7 April 1989.

NATO document ALP-9 First Draft, Land Forces Logistic Doctrine. Brussels; September 1989.

NATO Military Agency for Standardization document MAS (ARMY) 439-1/LOG, Report to the Army Board of the 15th Meeting of the Land Forces Logistic Doctrine Working Party. Brussels; 3 October 1989.

NATO Working Paper AC/143-WP/205, Industrial Planning Committee: The impact of developments in the European Communities (EC) for NATO industrial planning. Brussels; November 1989.

Pipeline Drag Reducer Task Force, CONOCO Presentation to NATO. NATO Logistics Directorate. Brussels; 1988.

SHAPE document AD 80-50 Volume 6, Logistics Reports.

SHAPE document AD 85-2, Logistics Policy and Guidance.

SHAPE document AD 85-6, Organizations and Standard Operating Procedures of the Allied Command Europe Logistics Coordinating Centre.

SHAPE document 1220.16/NS 004/SHLODA/82 dated 24 March 1982, SHAPE Guidance for Stockpile Planning in ACE.

SHAPE document 1220.10.1/SHLLO/075/87 dated 8 May 1987, Guide to Petroleum Planning in ACE.

US Assistant Secretary Defense Memorandum L-SPM dated 17 August 1987, Logistics 2010 - Strategies for the Future.

Western European Union Assembly document 1183 dated 26 April 1989, State of European security.

Western European Union Assembly document 1185 dated 3 May 1989, Future of European security.

Western European Union Assembly document 1186 dated 3 May 1989, New technologies and their implications for European Defence.

Wilberforce, J.F.G., Description of Soviet Logistic Doctrine and of Warsaw Pact Resupply Systems. UK's Defence Operations Analysis Establishment Working Paper 329/1 dated 1 June 1988.

**(b) Materials - Limited Availability**

Army Code 71451, Design for Military Operations - The British Military Doctrine. Prepared under the direction of the Chief of the General Staff. London; 1989.

Balck, Hermann, translation of taped conversation on 12 January 1979 by Battelle Columbus Laboratories, Tactical Technology Center. MIPR No. FY 7615-78-05106. Columbus, Ohio; 1979.

Bush, George, author's transcript of the President's speech "Afternoon Intervention on the Future of Europe", delivered at NATO Headquarters, Brussels on 4 December 1989.

Carlucci, Frank C., Secretary of Defense Annual Report to the Congress - Fiscal Year 1989. Washington, D.C., US Government Printing Office, 1988.

-----, Secretary of Defense Report to the Congress on Allied Contributions to the Common Defense. Washington, D.C.; US Department of Defense, 1988.

-----, Secretary of Defense Annual Report to the Congress - Fiscal Year 1990. Washington, D.C.; US Government Printing Office, 1989.

Gorbachev, Mikhail, unofficial translation of speech given at the State Dinner at 10 Downing Street, London on the evening of 6 April 1989.

-----, unofficial translation of the President's address at the Guildhall, London on 7 April 1989.

House of Commons, Third Report from the Defence Committee Session 1984-85: Defence Commitments and Resources and the Defence Estimates 1985-86. London; Her Majesty's Stationery Office, 23 May 1985.

-----, Second Report from the Defence Committee Session 1985-86: Statement on the Defence Estimates 1986. London; Her Majesty's Stationery Office, 5 June 1986.

-----, Seventh Report, Defence Committee Session 1987-88: Statement on the Defence Estimates 1988. London; Her Majesty's Stationery Office, 28 June 1988.

-----, Third Report from the Foreign Affairs Committee Session 1987-88: The Political impact of the process of Arms Control and Disarmament. London; Her Majesty's Stationery Office, 20 July 1988.

Independent European Programme Group Communiqué issued following the Ministerial Meeting held at Sevilla on 22 June 1987. Brussels; IEPG Secretariat UK Delegation to NATO; 1987.

Karber, Phillip A., Soviet Implementation of the Gorbachev Unilateral Military Reductions: Implications for conventional arms control in Europe. Evidence given before the House Armed Services Committee on 14 March 1989. Washington, D.C.; BDM Corporation, 1989.

National Audit Office, Report by the Comptroller and Auditor General, Ministry of Defence: Control and

Use of Manpower. London; Her Majesty's Stationery office, 27 April 1989.

NATO catalogue AOP-6 (C). Land Forces Ammunition Interchangeability Catalogue. Edition No.4, February 1984.

NATO's Defence Planning Committee Report, Enhancing Alliance Collective Security. Shared Roles, Risks and Responsibilities in the Alliance. Brussels; NATO Headquarters, December 1988.

NATO's Defence Planning Committee Progress Report, Shared Roles, Risks and Responsibilities in the Alliance. Brussels; NATO Headquarters, November 1989.

NATO document, A Comprehensive Concept of Arms Control and Disarmament. Adopted by Heads of State and Government at the meeting of the North Atlantic Council in Brussels on 29-30 May 1989. Brussels; NATO Information Service, 1989.

NATO Press Communiqués issued following the May and December meetings of the Defence Planning Committee commencing 16-17 May 1984 to 28-29 November 1989 - NATO Communiqué M-DPC - 2 (89) 44. Brussels; 29 November 1989.

NATO Press Communiqués issued following the Nuclear Planning Group meeting in Montebello, Canada on 27-28 October 1983; and following the meeting held at NATO Headquarters, Brussels on 19-20 April 1989.

NATO Press Communiqués issued by the Heads of State and Government participating in the meeting of the North Atlantic Council in Brussels on 2-3 March 1988. NATO Communiqué M-1 (88) 12 dated 2 March 1988 and M-1 (88) 13 dated 3 March 1988.

NATO Press Communiqué issued by the Heads of State and Government participating in the meeting of the North Atlantic Council in Brussels on 29-30 May 1989. NATO Communiqué M-1 (89) 21 dated 30 May 1989.

NATO STANAG 2115 - Fuel Consumption Unit.

NATO STANAG 2135 - Procedures for Emergency Logistic Assistance.

NATO STANAG 2945 - NATO Civil/Military Ground Fuels Interchangeability Catalogue.

NATO STANAG 2961 - Classes of Supply of NATO Land Forces.



Nunn, Sam, & Bartlett, Dewey F., NATO and the New Soviet Threat. Report to the Committee on Armed Services United States Senate. Washington, D.C.; US Government Printing Office, 24 January 1977.

Rogers, Bernard W., transcript of recorded documentary in conversation with Ian Davidson for a Radio 4 Analysis programme on 13 May 1987.

Tape No. TLN 719/87 TA 0019, British Broadcasting Corporation, London.

UK Ministry of Defence, NATO Military Standardization and Terminology. A guide to the procedures of the NATO Military Agency for Standardization. MOD document D/ACDS (Concepts)/310/2/NMST Edition 2, May 1988.

US Army Training Manual TM 30-430. Chapter VII - Logistics. Washington, D.C.; Headquarters Department of the Army, 1 March 1946.

US Army Field Manual FM 63-1. Combat Service Support Operations - Separate Brigade. Washington, D.C.; Headquarters Department of the Army, 30 September 1983.

US Army Field Manual FM 63-2. Combat Service Support Operations - Division. Washington, D.C.; Headquarters Department of the Army, 21 November 1983.

US Army Field Manual FM 63-20. Forward Support Battalion. Washington, D.C.; Headquarters Department of the Army, 18 February 1986.

US Army Field Manual FM 63-21. Main Support Battalion. Washington, D.C.; Headquarters Department of the Army, 18 February 1986.

US Army Reference Book. Aldershot; UK School of Transportation, 1 May 1986.

US Distribution Management. Aldershot; UK School of Transportation, 1 November 1985.

US Congressional Budget Office, The Army of the Nineties: How Much Will It Cost? Washington, D.C.; Congress of the United States - CBO Study, December 1986.

-----, Alliance Burden-Sharing: A Review Of The Data. Washington, D.C.; Congress of the United States - CBO Staff Working Paper, June 1987.



US Military Logistics. Aldershot; UK School of Transportation, 1 April 1982.

US Military Posture FY 1989. Prepared by the Joint Staff. Washington, D.C.; Government Printing Office, 1988.

Van Houwelingen, Jan, author's transcript of the speech by the Secretary of State for Defence of the Netherlands to the Colloquy on European Cooperation in armaments research and development held in London, 7 March 1988.

Van Vulpen, Carl H.A., author's transcript of a speech by the Deputy Director General Central Supplies Agency (a civil NATO wartime agency), on Western Industries Tomorrow; delivered at a Civil Emergency Planning Conference at The Hague on 14 October 1986.

Weinberger, Caspar W., Secretary of Defense Annual Report to the Congress - Fiscal Year 1986. Washington, D.C.; US Government Printing Office, 1985.

-----, Secretary of Defense Annual Report to the Congress on Allied Contributions to the Common Defense. Washington, D.C.; US Department of Defense, 1987.

Wörner, Manfred, opening address by NATO's Secretary General to the North Atlantic Council meeting at the level of Heads of State and Government on 29 May 1989. Brussels; NATO Information Service, 1989.

### (c) Interviews/Discussions

#### 19 January 1987 - Munchengladbach

Major A.J.M. Smetham, Staff Officer Logistic Supplies - Headquarters Northern Army Group.

#### 21-22 January 1987 - Brussels

Major General Homer D. Smith Jr., Director of Logistics NATO.

Mr D.A. Simpson, Logistics Directorate NATO's International Staff.

Major P.E. Brou, Jr., NATO's Military Agency for Standardization.

7 May 1987 - Grantham

Lieutenant Colonel G.A. Vaughan, Former Staff Officer Logistic Plans SHAPE.

14 May 1987 - Mons

Colonel Richard A. Orsini, Chief of Logistic Plans and Policy SHAPE.

Lieutenant Colonel C.W. Paskell, Logistic Plans SHAPE.

Wing Commander R. Springett, Logistic Policy SHAPE.

Lieutenant Colonel R. Smith, Petroleum Branch SHAPE.

Major L.J. Notman, Movements Plans and Policy SHAPE.

30 September/1 October 1987 - Brussels

Ms F. Onan, International Staff - North Atlantic Assembly.

Commodore E.R. Daniel Geluyckens, Logistics Directorate NATO's International Staff.

1-5 February 1988 - Brussels

Lord Carrington, Secretary General NATO.

Mr P.S. Waters, Civil Emergency Planning Directorate, NATO's International Staff.

Mr D.A. Simpson, Logistics Directorate, NATO's International Staff.

Mr K. Kaiser, Civil Emergency Planning Directorate, NATO's International Staff.

Lieutenant Colonel C.W. Paskell, Logistic Plans SHAPE.

Major P.E. Brou, Jr., NATO's Military Agency for Standardization.

6-7 July 1988 - London

General John R. Galvin, Supreme Allied Commander Europe.

Major General S.R.A. Stopford, Director General of Fighting Vehicles and Engineer Equipments.

20 October 1988 - Brussels

Attended as an observer, the Senior NATO Logisticians Conference which was opened by the Secretary General NATO.

17 January 1989 - London

Brigadier S. Cowan, Director of Public Relations (Army); Ministry of Defence.

14 March 1989 - Brussels

Brigadier F.A.L. Alstead, Coordinator Executive Working Group Study for the DPC.

Mr D.A. Simpson, Logistics Directorate NATO's International Staff.

Mr J. Day, First Secretary, European Defence Cooperation and Eurogroup Secretary; British Delegation to NATO.

15 March 1989 - Deventer, The Netherlands

Colonel J. Schouten, Former Assistant Chief of Staff for Logistics, Northern Army Group.

16 March 1989 - Brussels

Colonel H.D. Jüchtern, Branch Chief Logistics, International Military Staff, NATO Headquarters.

Mr P. Tipple, First Secretary, Defence Plans and Policy; British Delegation to NATO.

19 April 1989 - London

Colonel W.J. Horsfall, Assistant Director (Operational Requirements) International Collaboration; Ministry of Defence.

21-22 June 1989 - Brussels

Brigadier General James Piner, Jr., Director of Logistics NATO.

Mr William B. Taylor, Jr., Special Deputy Defense Advisor; US Mission to NATO.

12 July 1989 - Catterick

Major General I.S. Baxter, Assistant Chief of the Defence Staff (Logistics); Ministry of Defence.

3 October 1989 - Teesside

Brigadier G.E. Bartlett, Director of Movements (Army); Ministry of Defence.

8 November - 6 December 1989 - Brussels

Ambassador Alfred Cahen, Belgian Ambassador to France, former Secretary General of the Western European Union and Lecturer and Chairman of the Centre for the Study of International Relations at the Free University of Brussels.

Ambassador Henning Wegener, Assistant Secretary General for Political Affairs NATO.

Brigadier General James Piner, Jr., Director of Logistics NATO.

Dr Jamie P. Shea, Special Projects Officer, Political Affairs Directorate, NATO's International Staff.

Mr A.A. Marchioli, Logistics Directorate, NATO's International Staff.

Major G. Motsek, NATO's Military Agency for Standardization.

Mr K. Kaiser, Civil Emergency Planning Directorate, NATO's International Staff.

19 December 1989 - London

Lieutenant General Sir Anthony Mullens, Deputy Chief of the Defence Staff (Systems); Ministry of Defence.

---

## SECTION II

Abshire, David M., The American Commitment to the North Atlantic Alliance. The Alliance Papers No.1. Brussels; US Mission to NATO, 1984.

-----, NATO: Honing The Grand Strategy  
The Alliance Papers No.2. Brussels; US Mission to NATO, 1984.

-----, NATO at the Moral Crossroads.  
The Alliance Papers No.3. Brussels; US Mission to NATO, 1985.

-----, NATO on the Move. The Alliance Papers No.6. Brussels; US Mission to NATO, 1985.

-----, Can We Prevent World War III?  
The Alliance Papers No.7. Brussels, US Mission to NATO, 1985.

Alstead, F.A.L., Ten in Ten? A NATO fellowship study reference LOG/SUPP-A (88) 1. Brussels; NATO Headquarters, 1988.

Ashcroft, Geoffrey, Military Logistic Systems in NATO: The Goal of Integration Part I: Economic Aspects. Adelphi Papers No.62. London; Institute for Strategic Studies, 1969.

-----, Military Logistic Systems in NATO: The Goal of Integration Part II: Military Aspects. Adelphi Papers No.68. London; Institute for Strategic Studies, 1970.

Ashford, Nigel, European Defence Cooperation. A Second Pillar or a Third Force? London; British Atlantic Publications, 1988.

Azrael, Jeremy R., & Sestanovich, Stephen, Thoughts on "New Thinking". RAND Occasional Paper OPS-010. Santa Monica, California; RAND/UCLA Center for the Study of Soviet International Behaviour, 1988.

Bathurst, Robert, & Burger, Michael, Controlling the Soviet Soldier: Some Eyewitness Accounts. Center for Strategic Technology Texas A&M University Research Project No. RF4264. College Station Texas; Center for Strategic Technology The Texas A&M University System, 1981.

Baxter, I.S., Sustainability - a concept which may come of age. Paper presented at Kings College, London/ MOD Conference "Britain and the Central Region", held on 18-19 July 1989.



Betts, Richard K., Heavenly Gains or Earthly Losses? Toward a Balance Sheet for Strategic Defense. Brookings General Series Reprint 428. Washington, D.C.; The Brookings Institution, 1988.

Braddon, Derek and Kendry, Adrian, The Defence Dilemma - Is Competition Enough? Occasional Research Paper in Economics. Bristol; Bristol Polytechnic, 1986.

Brook, Stephen, The Sixth Day War - A Logistic Success. Transcript of a presentation by 2 Infantry Division Transport Regiment to an officer's logistic study held in York on 3 February 1989.

Brown, Kenneth N., Strategics - the logistics - strategy link. A National Security Essay. Washington D.C.; National Defense University Press, 1987.

Callaghan, Jr., Thomas A., Pooling Allied and American Resources to produce a Credible, Collective Conventional Deterrent. A Department of Defense contract report MDA 903-84-C-0274. Bethesda, Maryland; 1988.

Canby, Steven, The Alliance and Europe: Part IV Military Doctrine and Technology. Adelphi Papers No. 109. London; Institute for Strategic Studies, 1974.

-----, The Conventional Defense of Europe: The Operational Limits of Emerging Technology. The Wilson Center Working Papers No.55. Washington, D.C.; The Wilson Center, 1984.

Carrington, Lord, NATO: The Shared Defense of Freedom. The Alliance Papers No.5. Brussels; US Mission to NATO, 1985.

-----, NATO: Sharing the Burden. The Alliance Papers No.10. Brussels; US Mission to NATO, 1986.

Chalmers, Malcolm, The 1987 Defence Budget: Time for Choice? Peace Research Report No.17. Bradford; School of Peace Studies University of Bradford, 1987.

-----, & Unterseher, Lutz, Is there a Tank Gap? Peace Research Report No.19. Bradford; School of Peace Studies University of Bradford, 1987.

Coker, Christopher, Less Important than Opulence. The Conservatives and Defence. London; Institute for European Defence & Strategic Studies, 1988.

Dalziel, S.P.C., The Warsaw Pact and NATO. Soviet Studies Research Centre precis G11. Sandhurst; Royal Military Academy, 1985.

-----, Concepts of Peace in the Soviet Mind. Soviet Studies Research Centre precis J5. Sandhurst; Royal Military Academy, 1986.

Davis, Paul K., The Role of Uncertainty in Assessing the NATO-Pact Central-Region Balance. RAND Research Paper 7427. Santa Monica, California; The RAND Corporation, 1988.

Defence Information Groups, Assessing the conventional balance in Europe. London; Defence Information Groups, 1987.

Dick, C.J., Soviet Battle Drills. Vulnerability or Strength? Soviet Studies Research Centre precis A67. Sandhurst; Royal Military Academy, 1984.

-----, Soviet Operational Concepts. Parts I and II. Soviet Studies Research Centre precis AA12. Sandhurst; Royal Military Academy, 1985.

-----, Soviet Views on Strategic and Operational Surprise and Deception. Soviet Studies Research Centre precis C57. Sandhurst; Royal Military Academy, 1986.

-----, Soviet Responses to Emerging Technology weapons and New Defensive Concepts. Soviet Studies Research Centre precis AA13. Sandhurst; Royal Military Academy, 1986.

Donnelly, C.N., Rear Support for the Soviet Ground Forces. Soviet Studies Research Centre precis. Sandhurst; Royal Military Academy, 1979.

-----, Echelonning. Soviet Studies Research Centre precis AA5. Sandhurst; Royal Military Academy, 1984.

-----, Soviet use of Military History for Operational Analysis: Establishing the parameters of the concept of Force Sustainability. Soviet Studies Research Centre precis C58. Sandhurst; Royal Military Academy, 1986.

-----, The Soviet Military Under Gorbachev. Soviet Studies Research Centre E27. Sandhurst; Royal Military Academy, 1986.

Epstein, Joshua M., The 1988 Defense Budget. Washington, D.C.; The Brookings Institution, 1987.

Erickson, John, The Soviet 'Conventional Option': Constraints in Time and Space. University of Edinburgh Defence Study precis. Edinburgh; Defence Studies, 1984.

EUROGROUP, Burden-Sharing. The European View. Brussels; The EUROGROUP Secretariat at NATO Headquarters, 1988.

European Security Study Group, Strengthening Conventional Deterrence in Europe: proposals for the 1980s. London; MacMillan Press, 1983.

Facer, Roger, The Alliance and Europe: Part III Weapons Procurement in Europe: Capabilities and Choices. Adelphi Papers No.108. London; Institute for Strategic Studies, 1975.

Fitzgerald, Mary C., Marshal Ogarkov On Modern War: 1977 - 1985. Professional Paper 443. Alexandria, Virginia; The Center for Naval Analysis, 1986.

Harvey, David, & Smith, Dexter Jerome, In Defence of Europe. A Bow Paper. London; Bow Publications Ltd., 1987.

Heisbourg, Francois, Strategic Choices: their roles in NATO's defence planning and force modernizations: Part II Adelphi Papers No.205. London; Institute for Strategic Studies, 1986.

Heriot-Watt University, Is there a defence spending crisis? Defence Finance Report No.1. Edinburgh; Heriot-Watt University Department of Accountancy & Finance, 1984.

-----, The Defence Business in the United Kingdom. Part I: The Ministry of Defence. Defence Finance Report No.2. Edinburgh; Heriot-Watt University Department of Accountancy & Finance, 1985.

-----, The Defence Business in the United Kingdom. Part II: The Defence Suppliers. Defence Finance Report No.3. Edinburgh; Heriot-Watt University Department of Accountancy & Finance, 1985.

-----, The Audit of Defence Expenditure - an international perspective. Defence Finance Report No.4. Edinburgh; Heriot-Watt University Department of Accountancy & Finance, 1985.

-----, Defence R&D: Perceptions and Realities. Defence Finance Report No.6. Edinburgh Heriot-Watt University Department of Accountancy & Finance, 1988.

Holden, Gerard, After INF: A New Warsaw Pact Military Doctrine? ADIU Report Vol 9 No.6. London; Armament & Disarmament Information Unit, 1987.

Hunt, Kenneth, The Alliance and Europe. Part II: Defence with fewer men. Adelphi Papers No.98. London; Institute for Strategic Studies, 1973.

Iklé, Fred C., Wohlstetter, Albert et al, Discriminate Deterrence. Report of the Commission on Integrated Long-Term Strategy. Washington, D.C., US Government Printing Office, 1988.

Independent European Programme Group, Towards a Stronger Europe: Volumes 1 & 2. A Report by an Independent Study Team established by Defence Ministers of Nations of the IEPG. Brussels; United Kingdom Delegation to NATO, 1986.

Karasik, Theodore W., & Nicholas, Thomas M., Novoe Myshlenie and the Soviet Military: The impact of reasonable Sufficiency on the Ministry of Defense. RAND Research Paper P-7521. Santa Monica, California; The RAND Corporation, 1989.

Kelly, Andrew, The Myth of Soviet Superiority. Peace Research Report No.14. Bradford; School of Peace Studies University of Bradford, 1987.

Laird, Robbin, & Clark, Susan, Britain's Security Policy. The Modern Soviet View. Occasional Paper No.31. London; Institute for European Defence & Strategic Studies, 1988.

Ledogar, Stephen J., European Defense Cooperation Outside the NATO Context: A US View. The Alliance Papers No.11. Brussels, US Mission to NATO, 1986.

Levine, Robert A., NATO, The Subjective Alliance. The Debate Over the Future. RAND Research Paper R-3607-FF/CC/RC. Santa Monica, California; the RAND Corporation, 1988.

Lunn, Simon, Burden-Sharing in NATO. Chatham House Papers: 18. London; Royal Institute of International Affairs, 1983.

Managing entry into the 21st Century. 25th Anniversary Conference Report. Paris; Atlantic Institute for International Affairs, 1986.

Market Access International, The Politics of British Defence Procurement. London; Market Access International Ltd., 1989.

McCausland, Jeff, Soviet Short Range Nuclear Forces. Soviet Studies Research Centre precis. Sandhurst; Royal Military Academy, 1983.



Moodie, Michael, Economics and Security. The Alliance Papers No.4. Brussels; US Mission to NATO, 1985.

-----, & Windsor, Robert, Managing technological change: an alliance imperative. The Alliance Papers No.12. Brussels US Mission to NATO, 1986.

North Atlantic Assembly, East-West Economic Relations. Brussels; North Atlantic Assembly Papers, 1984.

-----, Conventional Defence in Europe. A Comprehensive Evaluation. Military Committee report by the Sub-Committee on Conventional Defence in Europe, Rapporteur Karsten Voigt. Brussels; North Atlantic Assembly, 1985.

-----, The Economics of Atlantic Security. Economic Committee report, General Rapporteur Mr Maarten Engwirda. Brussels; North Atlantic Assembly, 1987.

-----, Defence Cooperation. Military Committee interim report by the Sub-Committee on Defence Cooperation, Co-Rapporteurs Mr Robert Badham, and Mr Peter Petersen. Brussels; North Atlantic Assembly, 1987.

-----, NATO - Warsaw Pact Military Balance. Nuclear Arms Control after Reykjavik. Military Committee general report on Alliance Security, General Rapporteur Mr Karsten Voigt. Brussels; North Atlantic Assembly, 1987.

-----, New Strategies Operational Concepts. Military Committee final report by the Sub-Committee on Conventional Defence, Rapporteur Mr Karsten Voigt. Brussels; North Atlantic Assembly, 1987.

-----, Nuclear Strategy and Arms Control. Interim report by the Special Committee on Nuclear Strategy and Arms Control, Rapporteur Mr John Cartwright. Brussels; North Atlantic Assembly, 1987.

-----, NATO in the 1990s. Special report of the North Atlantic Assembly. Brussels; North Atlantic Assembly, 1988.

-----, Advanced Technology and Technology Transfer. Brussels; North Atlantic Assembly Papers, 1988.

-----, Cooperation in Research



and Development. Interim report of the Scientific and Technical Sub-Committee, Rapporteur Mr Robert Banks. Brussels; North Atlantic Assembly, 1988.

-----, Norway, The United States, The Federal Republic of Germany and Denmark. Civilian Affairs Committee interim report of the Sub-Committee on Public Information on Defence and Security, Mrs Inger-Lise Skarstein. Brussels; North Atlantic Assembly, 1988.

-----, Burden-Sharing in the Alliance. Defence and Security Committee report by the Sub-Committee on Defence Cooperation, Rapporteur Mr José Lello. Brussels; North Atlantic Assembly, 1988.

-----, New Patterns of European Security Collaboration. Defence and Security Committee interim report of the Sub-Committee on Conventional Defence, Co-Rapporteurs Mr Rafael Estrella and Mr Jamie Gama. Brussels; North Atlantic Assembly, 1988.

-----, Towards Conventional Stability in Europe. Defence and Security Committee general report on Alliance Security, General Rapporteur Mr Karsten Voigt. Brussels; North Atlantic Assembly, 1988.

-----, CSCE - The Vienna Conference. Brussels; North Atlantic Assembly Papers, 1989.

O'Connell, James, Foxhunter Radar just the tip of an iceberg of Air Defence problems. Peace Studies Briefing No.31. Bradford; School of Peace Studies University of Bradford, 1987.

Osgood, Robert, & Wegner, Henning, Deterrence: The Western Approach. NATO Information Service - Study Series 17. Brussels; NATO Headquarters, 1986.

Pick, Otto, Prospects for East-West Relations. London; British Atlantic Publications, 1986.

Plesch, Dan, Preparing for the first use of nuclear weapons in Europe: creating a more usable nuclear force. Peace Research Report No.16. Bradford; School of Peace Studies University of Bradford, 1987.

Rich, Michael, Cohen, I.K., & Pyles, R.A., Recent Progress in Assessing the Readiness and Sustainability of Combat Forces. RAND Air Force report R-3475-AF. Santa Monica, California; The RAND Corporation, 1987.

Rode, M.K.J., Burden-Sharing in the North Atlantic Alliance. London; Seaford House Papers, 1986.

Rogers, Bernard W., NATO Strategy: Time to Change? The Alliance Papers No.9. Brussels; US Mission to NATO, 1985.

-----, NATO's Strategy: An undervalued currency. Adelphi Papers No.205. London; Institute for Strategic Studies, 1986.

Sadykiewicz, Michael, Soviet-Warsaw Pact Western Theater of Military Operations: Organization and Missions. RAND Study. Santa Monica, California; The RAND Corporation, 1987.

Schapiro, Leonard B., The Nature of Soviet Foreign Policy. A paper presented to the Academic Council for Peace and Freedom seminar held at the University of Nottingham on 20 October 1983.

Schwartz, David, Alliance Security: NATO and the no-first-use question. Washington, D.C., The Brookings Institution, 1983.

Sokolsky, Joel J., & Crickard, F.W., & Boardman, Robert eds., NATO: Towards the Year 2000. Papers presented at a conference in Halifax, N.S. May 1986. Halifax, Nova Scotia; Centre for Foreign Policy Studies Dalhousie University, 1987.

Soviet Studies Research Centre, The Warsaw Pact. Research Centre Precis No. G10. Sandhurst; Royal Military Academy, 1984.

-----, Soviet Operational Planning: Staff Officer Training. Research Centre Precis No. AA9. Sandhurst; Royal Military Academy, 1986.

-----, The Sustainability of the Soviet Army in Battle. Consultant Report STC CR-65 undertaken for the SHAPE Technical Centre, The Hague. Sandhurst; Royal Military Academy, 1986.

Stoeckli, H.F., Soviet Operational Planning: Superiority Ratios vs Casualty Rates. Soviet Studies Research Centre precis AA6. Sandhurst; Royal Military Academy, 1985.

-----, Soviet Tactical Planning: Overcoming Anti-Tank Defences. Soviet Studies Research Centre precis A69. Sandhurst; Royal Military Academy, 1986.

Sullivan, Jr., Leonard, & Etzold, Thomas H., Security

and Stability in Conventional Forces: Differing Perceptions of the Balance. A consultation draft occasional paper. Washington, D.C.; The Atlantic Council of the United States, 1988.

Taylor, Trevor, European Defence Cooperation. Chatham House Paper No.24. London; Royal Institute of International Affairs, 1984.

Taylor, Jr., William B., ed., Beyond Burden-Sharing - Future Alliance Defense Cooperation. The Alliance Papers: Proceedings No.1. Brussels; US Mission to NATO, 1989.

The NATO 40th Anniversary Summit. May 29-30, 1989. The Alliance Papers No.20. Brussels; US Mission to NATO, 1989.

Thompson, James A., NATO's Strategic Choices: Defense Planning and Conventional Force Modernization. RAND research study P-7184. Santa Monica, California; The RAND Corporation, 1986.

-----, Strategic Choices: Their Roles in NATO's Defence Planning Force Modernizations: Part I. Adelphi Papers No.205. London; Institute for Strategic Studies, 1986.

Trulock III, Notra, Soviet Perspectives on Limited Nuclear Warfare. Soviet Studies Research Centre precis C55. Sandhurst; Royal Military Academy, 1986.

Unterseher, Lutz, Conventional Land Forces for Central Europe: A Military Threat Assessment. Peace Research Report No.15. Bradford; School of Peace Studies University of Bradford, 1987.

US Congress - Office of Technology Assessment, Technologies for NATO's Follow-On Forces Attack Concept. A Special Report of OTA's Assessment on Improving NATO's Defense Response OTA-ISC-312. Washington, D.C.; US Government Printing Office, 1986.

Weinrod, W. Bruce, ed., The US and NATO: Should the Troops Stay? Transcript of The Heritage Lectures of 8 May 1987. Washington, D.C.; The Heritage Foundation, 1987.

Whitehall Paper, Conventional Defence: Issues and prospects. Based on proceedings of a conference held at the RUSI. London; Royal United Service Institute for Defence Studies, 1987.

Windass, Stan, & Grove, Eric, eds., Common Security in Europe 1988. Foundation research paper. Adderbury, Oxfordshire; Foundation for International Security, 1988.

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### SECTION III

Abramov, K.N., "Logistic Support of Fronts in Encirclement Operations", Voyenno-istoricheskiy zhurnal, No.6 (June 1986), pp.31-38.

Abshire, David M., "NATO's Conventional Defence: The Need for a Resources Strategy", NATO Review, No.5 (October 1984), pp.8-14.

-----, "A Resources Strategy for NATO", NATO's Sixteen Nations (October 1985), pp.62-63, 65-66, 68 & 69.

-----, and Moodie, Michael., "NATO Armaments Cooperation: An Action Plan for the Future", NATO's Sixteen Nations (December 1987 - January 1988), pp.12-15.

Acuff, Ron, "Making better use of Resources", Army Logistician (July - August 1988), pp.27-29.

Akhromeyev, S.F., "The Superiority of Soviet Military Science and Soviet Military Art - One of the Most Important Factors in Victory in the Great Patriotic War", Kommunist vooruzhennykh sil (No.3/1985), p.49.

-----, "What Lies Behind NATO's Brussels Statement?", Krasnaya zvezda (20 March 1988), p.3.

Alekseyev, V., "In the Staffs and Armies of Imperialist States: 'Conventional' Wars and Ways of Waging Them", Krasnaya zvezda (3-4 October 1986), Second Edition, pp.3-4.

Alexander, George M., "Military Logistics", Journal of Defense and Diplomacy (No.6/1986), pp.43-45 & 62.

Alexander, Michael, "The Political Challenge from the East", NATO Review (June 1988), pp.7-12.

-----, "1988: How Well Will The Alliance Cope?", RUSI Journal (Spring 1988), pp.9-14.

Allen, Richard F., "Corps-Level Logistics: In or Out of Focus", Military Review (September 1988), pp.2-19.

Altenburg, Wolfgang, "Arms Control and the Needs of NATO Armed Forces", RUSI Journal (Autumn 1988), pp.9-12.

-----, "NATO: Current Issues and Military Thinking", RUSI Journal (Autumn 1989), pp.9-11.



-----, "Arms Control and the Future", NATO Review (August 1989), pp.1-5.

-----, "NATO's Integrated Military Structure - A Unique Success", NATO's Sixteen Nations (Special Edition 1/1989), pp.36-38, 41-42, 44 & 47.

Anderson, Ewan, "NATO procurement must travel a two-way street: A new spirit of cooperation evolves", Journal of Defense & Diplomacy (Vol 5 No.9 1987), pp.32-34.

Andreotti, Giulio, "Change and Continuity, A Source of Vitality", NATO Review (February 1989), pp.7-12.

Armstrong, Richard N., "Initiative Soviet Style", Military Review (June 1984), pp.15-26.

Aspin, Les, "Conventional forces in Europe: Unilateral moves for stability", Bulletin of the Atomic Scientists (December 1987), pp.12-15.

Atkeson, Edward B., "The New Pact Doctrine: Implications for NATO", Army (November 1988), pp.11-14.

Bacon, J.R., "The Channel Tunnel - A Line Of Communication To BAOR?", Royal Corps of Transport Review (June 1988), pp.11-16.

Bahnsen, Jr., John C., "Mr President, We Can't Go!", Armed Forces Journal International (October 1987), pp.112-116.

Bahnemann, Joerg, "Extending Air Defence - a test case for the Western Alliance", NATO's Sixteen Nations (September 1988), pp.46-48; 50-51.

Bailer, Seweryn, "'New Thinking' and Soviet foreign policy", Survival (July 1988), pp.291-309.

Barber, Lionel, "Cheney outlines defence cuts", Financial Times (26 April 1989), p.8.

Baring, Arnulf, "Transatlantic relations. The view from Europe", NATO Review (February 1989), pp.17-23.

Barry, John, "Fight Smart, Not Rich", Newsweek (14 November 1988), pp.10-11.

Barry, W.B., et al, "Future Airmobile Forces", RUSI Journal (Autumn 1988), pp.33-40.

Barton, A.B., "Logistic Concept to Support the Manoeuvre Battle", Royal Corps of Transport Review (June 1988), pp.17-20.

Basil, Robert A., "Rules of the Road for the Two-Way Street", Armed Forces Journal International (December 1987), pp.78-79.

Baxter, William P., "Soviet POL: Problem And Solution Heroic", Army (May 1982), pp.61-63.

Beard, Robin, "New NATO Approaches to Improved Armaments Cooperation", NATO's Sixteen Nations (November 1986), pp.26-32.

-----, "NATO armaments cooperation: picking up the gauntlet", NATO Review (February 1987), pp.10-15; 32-33.

Beatty, Perrin, "Gaining public support for greater defence efforts - a Herculean task", NATO Review (April 1988), pp.1-6.

Beaudan, Eric Y., "Sustainability in the Offing", National Defense (January 1988), pp.37-40.

Beaumont, R.A., "Beyond Teeth and Tail: The Need for New Logistical Analogies", Military Review (March 1985), pp.3-11.

Becton, Jr., Julius W., "Civil Emergency Planning: NATO's hidden strength", NATO Review (August 1988), pp.29-32.

Bedford, P.A., "Defence Deterrence and Perceived Offensive Threat", British Army Review (April 1986), pp.23-27.

Bell, Michael J., "Flexible response - Is it still relevant?", NATO Review (April 1988), pp.12-17.

-----, "Conventional Defence Improvement - A New Momentum", NATO's Sixteen Nations (April/May 1988), pp.35-41.

Belyayev, A., "Scientific Concepts of Modern Warfare - An Important Element in the Awareness of the Soviet Fighting Man", Kommunist vooruzhennykh sil (April 1985), pp.24-31.

Berest, Georges, "INF Impact: 'Deplorable on Three Counts, Useful on One'", Armed Forces Journal International (December 1987), p.88.

Berhin, Jean, "The Belgian Army's Contribution to the NATO Land Battle", NATO's Sixteen Nations (October 1988), pp.14-17.

Bertram, Christoph, "Deterrence, Defence and Arms Control", NATO's Sixteen Nations (September 1988), pp.21-24 & 27.

Betts, Richard K., "NATO's Mid-Life Crisis", Foreign Affairs (Spring 1989), pp.37-52.

Biddle, Stephen D., "The European Conventional balance: A reinterpretation of the debate", Survival (March/April 1988), pp.99-121.

Block, Bruce A., "USAREUR's Logistics Strength", Army Logistician (November - December 1987), pp.7-9.

Bluth, Christoph, "SDI: The Challenge to West Germany", International Affairs (Spring 1986), pp.247-264.

Bocklet, Richard, "NATO turns 40: Is the Alliance over the hill?", International Combat Arms (July 1989), pp.70-75; 78-79; & 90.

Bogdanov, V., & Lokshin, G., "Reasonable Means Sufficient", X X Vek i Mir (December 1987), pp.2-9.

Bonnart, Frederick, "Alliance agrees resolute line as prelude to talks", The Times (10 June 1989), p.9.

-----, "NATO: Modernize Short-Range Nuclear Forces", International Herald Tribune (20 October 1988), p.8.

Bonsignore, Ezio, "The Shorter the Range..", Military Technology (April 1989), p.6.

Borawska, John, "Toward conventional stability in Europe?", The Washington Quarterly (Autumn 1987), pp.13-29.

Borinski, Philipp, "Another Look at USAREUR Deployment", Military Review (March 1987), pp.48-61.

Braude, Jonathan, "EEC seeks to create single European arms market", Jane's Defence Weekly (28 May 1988), pp.1044-1055.

Brinkley, William A., "Across the FLOT", Military Review (September 1986), pp.30-41.

Brown, Beverly, & Zealberg, Kevin, "Where is the Ammo?", Field Artillery Journal (March - April 1986), pp.20-23.

Brezzezinski, Zbigniew, "East - West: Think Big and Dose the Concessions", International Herald Tribune (13 March 1989), p.6.

Buchan, Alex, "Supply - RAF Style", Airforce Journal of Logistics (Spring 1988), pp.6-9.

Burandt, Eberhard, "Indispensable Partner", NATO's Fifteen Nations (Special 2/1981), pp.54, 57 & 60.

Burton, C.J., "Thoughts on a New Look for the 1st British Corps", British Army Review (December 1986), pp.44-52.

Bykov, A.O., "New Political Thinking in Action", Mirovaya ekonomika i mezhdunarodnye otnosheniya (No.2, 1988), pp.12-20.

Cahen, Alfred, "Unity through common defence - Western European Union", NATO's Sixteen Nations (June 1986), pp.38-40, 34 & 71.

-----, "Relaunching Western European Union. Implications for the Atlantic Alliance", NATO Review (August 1986), pp.6-12.

Callaghan, Jr., Thomas A., "Structural Disarmament: A Vengeful Phenomenon", Journal of Defense & Diplomacy (Vol 5 No.9 1987), pp.28-31.

-----, "NATO at forty needs a two-pillar treaty", NATO Review (August 1989), pp.21-26.

Calleo, David P., Cleveland, Harold van B., & Silk, Leonard, "The Dollar and the Defense of the West", Foreign Affairs (Spring 1988), pp.846-862.

Cannon, Morris C., "Direct Support Logistics", Military Review (May 1971), pp.18-23.

Carlberg, Ron, "Behind the Transatlantic Dialogue", NATO's Sixteen Nations (September - October 1984), pp.42-50.

Carlucci, Frank C., "A Policy Warning: The 'New Era' Isn't All That New", International Herald Tribune (28-29 January 1989), p.6.

Carrington, Lord, "Alliance Challenges and Opportunities", NATO Review (October 1987), pp.1-5.

-----, "NATO and the Warsaw Pact: Future relationships and strategies", RUSI Journal (December 1987), pp.3-7.

-----, "East-West Relations, A time of far-reaching change", NATO Review (June 1988), pp.1-6.

Carver, Lord, "Armed Forces - for peace or war?", Review of International Studies (April 1988), pp.87-95.

-----, "The eternal interests", The Guardian (20 February 1989), p.36.



Cauchie, Marc - A., "Military Logistics: From History to the Perspective of its International Expansion", Air Force Journal of Logistics (Winter 1989), pp.13-16.

Cauchie, Robert, "Allied armament cooperation - a Belgian view", NATO's Sixteen Nations (October 1987), pp.22-27.

Chernyshev, V., "Conventional War in Europe?", Krasnaya zvezda (29 March 1988), p.3.

Chodakewitz, Susan B., Deane, Michael J., & Weatherly, Stephen G., "Soviet Strategic C3: The Threat and Counterthreat", Signal (December 1985), pp.33-36.

Cimbala, Stephen J., "NATO vulnerabilities: Is defeat possible?" Military Review (June 1985), pp.58-70.

-----, "The Soviet Command System: Military challenges and Western Responses", Signal (November 1987), pp.97-101.

-----, "conventional war in Europe: The unavoidable nuclear backdrop", Defense Analysis (Vol 4 No.4 1988), pp.361-376.

Cimral, Ted A., "Moving the Heavy Corps", Military Review (July 1988), pp.28-34.

Clark, Susan L., "Who will Staff NATO?", Orbis (Fall 1988), pp.521-539.

Clarke, Bruce C., "The Importance of Tactical Logistics", Army Logistician (January - February 1987), p.6.

Clough, Patricia, "Wörner attacks German policy", The Independent (18 November 1988), p.10.

Cohen, Eliot A., "Towards Better Net Assessment - Rethinking the European Conventional Balance", International Security (Summer 1988), pp.50-89.

Cohoon, Thomas, "Airlift Reinforcing Europe", NATO's Sixteen Nations (June 1989), pp.56-57; 60-62.

Coker, Christopher, "Discriminate Deterrence and the Alliance", Strategic Review (Spring 1988), pp.51-59.

-----, "Arms: a neglected target", The Times (17 August 1988), p.10.

Colombo, Emilo, "Political union for Europe", NATO's Sixteen Nations (September - October 1984), pp.14-16.



Conner, Albert Z., & Poirier, Robert G., "Soviet Ground Force Mobilization Potential: Lessons of the Past and Implications for the Future", The Journal of Soviet Military Studies (June 1988), pp.213-230.

Colston, B.E., "Movements - the Fulcrum of Operations and Logistics", British Army Review (August 1989), pp.24-26.

Cooper, David A.R., "Towards Armaments Planning at NATO", Canadian Defence Quarterly (Summer 1988), pp.38-42.

-----, & Rupp, Rainer, "Defence Procurement - thinking some thoughts out aloud", NATO's Sixteen Nations (December 1988), January 1989), pp.28-31.

Cooper, Frank, "the European pillar in armament production", NATO's Sixteen Nations (June 1986), pp.32-33; 35-37.

Cordesman, Anthony H., "Fatal Flaws in Presenting the NATO/Warsaw Pact Balance", Armed Forces Journal International (July 1988), pp.60-68.

-----, "Net Assessment and Defense Resources - Challenges for the Next Administration", The Washington Quarterly (Spring 1989), pp.129-149.

-----, "US Defence in 1988: The Morning After", RUSI Journal (Spring 1988), pp.27-34.

Cornwell, Rupert, "Gorbachev reveals £77 bn defence cost", The Independent (31 May 1989), p.11.

Cortier, Peter, "NATO, Too, Has Fresh Ideas for Improving Relations", International Herald Tribune (3 August 1988), p.4.

Cotter, Donald R., "The Need for a Serious Conventional Defense Initiative", Signal (October 1987), pp.73-81.

Courter, Jim, "Can NATO Strategy Work?", Military Review (June 1987), pp.3-13.

Coutinho, John de S., "Battlefield damage: assessment and repair", Military Review (February 1988), pp.54-62.

Covington, Stephen R., "Defensive actions in a Soviet strategic offensive", International Defense Review (No.2/1989), pp.147-150.

-----, "NATO and Soviet Military Doctrine", The Washington Quarterly (Autumn 1989), pp.73-81.

Cross, Neville H., "The Lethal Solution: ammunition developments", Defence Communications Security Review (No.28/1989), pp.6-10.

Crowe, Jr., William J., "Why Cut Back a Winner?", International Herald Tribune (11 April 1989), p.6.

Curtis, Ian, "1992 And All That", Defense & Foreign Affairs (October/November 1988), pp.27-29, 36.

-----, "Success in INF; Failure in Strategy", Defense and Foreign Affairs (May/June 1989), pp.18-19; 29-30.

Cutileiro, José, "A Portuguese View: Keep the Atlantic Alliance", International Herald Tribune (14 April 1989), p.4.

Dalecky, William J., "The Strategy of the Indirect Approach applied to NATO", Air University Review (November - December 1986), pp.52-62.

Dauber, Cori, "Validity Standards and the Debate over Nuclear Strategic Doctrine", Defense Analysis (Vol 5 No.2, 1989), pp.115-129.

Dean, Jonathan, "Military Security in Europe", Foreign Affairs (Fall 1987), pp.22-40.

-----, "Alternative Defence: answer to NATO's Central Front Problems?", International Affairs (Winter 1987/88), pp.61-82.

-----, "How to reduce NATO and Warsaw Pact Forces", Survival (March/April 1989), pp.109-122.

Defense Monitor, "NATO and Warsaw Pact Forces: Conventional War in Europe", The Defense Monitor (Vol xvii, No.3 1988), pp.1-8.

de Fabribeckers, E.C., "The Long Tail: Supply and Transport in the Modern Army", NATO's Sixteen Nations (Special Issue 1/1983), pp.100-102.

de Jager, Cornelis, "NATO's Strategy", NATO Review (October 1986), pp.9-14.

de Jong, F.J., "Offensive Air Operations in the Central Region", NATO's Sixteen Nations (February - March 1987), pp.81-84.

Dente, Jerome L., "Village Concept of Combat Service Support", Army Logistician (November - December 1981), pp.29-32.

d'Humieres, Septime Marie, "Logistics of the French Army", Army Logistician (January - February 1986), pp.2-6.

di Camerana, Bonifazio Incisa, "Sustainability - The Reserve Force Requirement", NATO's Sixteen Nations (July 1986), pp.40-43.

Dick, C.J., "Catching NATO Unawares: Soviet Army surprise and deception techniques", International Defense Review (No.1/1986), pp.21-26.

-----, "Soviet operational art Part 1: The fruits of experience", International Defense Review (No.7/1988), pp.755-761.

-----, "Soviet operational art Part 2: The keys to victory", International Defense Review (No.8/1988), pp.901-908.

di Lorenzo, Mario, "Keeping supplies moving at times of crisis or war", NATO Review (April 1983), pp.18-23.

Dobbs, Michael, "Kremlin Ends Conscription of Students", International Herald Tribune (31 March 1989), p.1.

Dolan, A., "The Warsaw Pact: The First Thirty Years", British Army Review (April 1986), pp.31-38.

Donnelly, C.N., "Rear Support for the Soviet Ground Forces", International Defense Review (April 1979), pp.344-350.

-----, "The Wind of Change in Soviet Artillery", International Defense Review (June 1982), pp.737-744.

-----, & Orr, M.J., "Soviet logistics flexibility", International Defense Review (July 1986), pp.948-949.

-----, "Future Soviet military policy Part 1: doctrine and economics", International Defense Review (January 1989), pp.19-22.

-----, "Future Soviet military policy Part 2: where and how", International Defense Review (February 1989), pp.141-145.

Drucker, P.F., "New Templates for Today's Organization", Harvard Business Review (January/February 1974), p.13.

Durie, I.G.C., "Directive Control - An Essential Tool for Manoeuvre Warfare", British Army Review (December 1989), pp.8-13.

Earl, Richard G., "Quality & Supply Chain Logistics", Management Services (June 1989), pp.6-12.

Eastern European Newsletter, "USSR: generally speaking", Eastern European Newsletter (10 August 1988), pp.4-5.

Eberle, James, "NATO and Bush: For Transatlantic Dialogue", International Herald Tribune (16 November 1988), p.8.

Economist, "Gorbachev takes on the generals", The Economist (6 June 1987), pp.59-60.

-----, "Look who's not cheating", The Economist (11 July 1987), pp.64-66.

-----, "Europe's braver colours", The Economist (11 July 1987), pp.13-14.

-----, "NATO exercises - strategy proven", The Economist (19 September 1987), pp.45-46.

-----, "Disarmament is a long word and it takes a long time to say", The Economist (30 July 1988), pp.45-47.

-----, "Time to make the allies pay?", The Economist (6 August 1988), pp.27-28.

-----, "Russia's armed forces: Stronger still", the Economist (20 August 1988), p.34.

-----, "Not Always This Oxlike", The Economist (20 August 1988), pp.12-13.

-----, "The battle of the burden", The Economist (28 January 1989), pp.41-43.

-----, "NATO versus Euro", The Economist (1 April 1989), p.15.

-----, "Less Kit", The Economist (6 May 1989), p.32.

Eggesbo, Bernard, "The need for armaments cooperation - a small nation perspective", NATO's Sixteen Nations (October 1987), pp.50-53.

Eimler, Eberhard, "The Role of Air Power in the Defence of the Central Region", NATO's Sixteen Nations (February - March 1987), pp.50-64.



-----, "The Way Ahead for NATO Forces", Canadian Defence Quarterly (Autumn 1988), pp.33-40.

Eisenhammer, John, "Hard facts force military down road of cooperation", The Independent (1 December 1988), p.14.

Else, Daniel H., "America's History: Its Future and the NATO Alliance", RUSI Journal (December 1986), pp.51-56.

Enthoven, Alain C., "Arms and Men - The Balance in Europe", Military Review (September 1969), pp.80-88.

Epstein, Joshua M., "Dynamic Analysis and the Conventional Balance in Europe", International Security (Spring 1988), pp.154-165.

-----, "The 3-1 Rule, the Adaptive Dynamnic Model and the Future of Security Studies", International Security (Spring 1989), pp.90-127.

Erickson, John, "Soviet Breakthrough Operations: Resources and Restraints", RUSI Journal (September 1976), pp.74-79.

-----, "The Army, The Party and The People", RUSI Journal (December 1976), pp.45-47.

-----, "Shoot First", The Scotsman (16 June 1989), p.11-12.

Evans, Michael, "Younger attacks arms self-interest in NATO", The Times (7 March 1988), p.2.

-----, "Gorbachev faces tough battle with officer corps", The Times (12 May 1989), p.6.

Fairhall, David, "The military steps to a political initiative", The Guardian (8 April 1988), p.23.

-----, "Disarmed by Gorbachev", The Guardian (8 December 1988), p.4.

Farndale, Martin, "Follow On Forces Attack", NATO's Sixteen Nations (April/May 1988), pp.42-50.

-----, "The Operational Level of Command", RUSI Journal (Autumn 1988), pp.23-29.

-----, "NATO after INF - Political and Military Scenarios", transcript of an address given at a Brassey's Seminar for Industry held in London on 8 December 1989, pp.21-31.



-----, "The Use of Helicopters on the European Battlefield", Vertiflite (May/June 1989), pp.16-19.

Fast, William R., "Operational level of support: in search of a doctrine", Military Review (February 1988), pp.46-53.

Fawcus, G.B., Letter concerning 1st British Corps logistic policy published in British Army Review (August 1985), p.78.

Fein, Esther, "Soviet Military Chief Rejects Volunteer Army", International Herald Tribune (11-12 February 1989), p.2.

Feldbrugge, Ferdinand J.M., "Gorbachev's reforms", NATO Review (December 1988), pp.16-21.

Fenske, John, "France and the Strategic Defence Initiative: speeding up or putting on the breaks?", International Affairs (Spring 1986), pp.231-246.

Ferenczy, Gabriel, "CIS in support of CDI: Improving NATO's Conventional Defences; the vital role of Communication and Information Systems", NATO's Sixteen Nations (April/May 1988), pp.57-63.

Field, Brian, "Economic theory, burden-sharing and the NATO Alliance", NATO Review (December 1988), pp.11-15.

Financial Times, "Burden-sharing in NATO", Financial Times (7 October 1988), p.22.

Fitchett, Joseph, "Experts Say Arms Cuts Won't Spur economies", International Herald Tribune (8 September 1988), pp.1 & 8.

-----, "US Is putting the arm on Allies to spend more on their own defense", International Herald Tribune (1 December 1988), pp.1 & 6.

-----, "National Security Gives Protectionists a Weapon", International Herald Tribune (16 December 1988), pp.1 & 14.

Flanagan, Stephen J., "Emerging tensions over NATO's conventional forces", International Defense Review (January 1987), pp.31-39.

-----, & Hamilton, Andrew, "Arms control and stability in Europe: reductions are not enough", Survival (September/October 1988), pp.448-463.

Flanagan, William J., "Korean War Logistics: the first hundred days", Army Logisticians (March - April 1986), pp.34-38.

Fleet, Michael, "New anti-tank rockets 'useless' against Soviets", The Daily Telegraph (17 August 1987), p.28.

Flume, Wolfgang, "Forward Defence with Fewer Standing Forces: The German Army's Future Structure", Military Technology (April 1988), pp.34-36.

Foster, Gregory, D., "Contemporary C<sup>2</sup> Theory Research: the failed quest for a philosophy of command", Defense Analysis (September 1988), pp.201-228.

Fowler, William, "Treading Softly", Defence (May 1987), pp.293-294.

-----, "Made in Great Britain: The British Army in the 1990s", Defence (June 1988), pp.394-396.

Fowler, Will, "U.K. Defense: Army", Journal of Defense & Diplomacy (July 1989), pp.10-14.

Fox, Robert, "spending to fall next year in real terms", The Daily Telegraph (16 November 1989), p.12.

Freedman, Lawrence, "Indignation, Influence and Strategic Studies", International Affairs (Spring 1984), pp.207-219.

-----, "Logistics and mobility in modern warfare", Armed Forces (February 1986), pp.65-70.

-----, "Why a military review is not a defeat", The Independent (25 June 1987), p.4.

-----, "Learning to dance on the other foot", The Independent (28 July 1989), p.21.

Freeman, Kenneth, "Defence Procurement Policy in Europe: Competition, Industrial Policy and Restructuring", RUSI Journal (December 1987), pp.23-32.

Fritz, F., "Soviet C<sup>2</sup> Information Systems: Theories, Concepts, Evaluations", Signal (December 1988), pp.35-42.

Galvin, John R., "Grass Roots Logistics", Army Logistician (July - August 1984), pp.2-7.

-----, "Allied Command Europe - Buttressing the Means", SHAPE Information Office (08141300A 87), pp.1-12.

-----, "The INF Treaty - no relief from the burden of defence", NATO Review (February 1988), pp.1-7.

-----, "Comparing Forces: NATO and the Warsaw Pact", NATO's Sixteen Nations (April/May 1988), pp.15-23.

-----, "The continuing validity of flexible response and forward defence", RUSI Journal (Summer 1988), pp.5-9.

-----, "Transatlantic Partnership for Security: Canada in NATO", Canadian Defence Quarterly (Summer 1988), pp.9-16.

-----, "Euphoria over INF Treaty poses serious challenges for NATO military leaders", Army (September 1988), pp.18-28.

-----, "Cooperation in Armaments production - a key element of deterrence", NATO Review (October 1988), pp.17-21.

-----, "Nuclear Modernization: Points for the Discussion", International Herald Tribune (18 April 1989), p.4.

-----, "Getting better: Improving capabilities for deterrence and defence", NATO Review (April 1989), pp.11-16.

-----, "A Strategy for the Future", RUSI Journal (Autumn 1989), pp.15-18.

Gasteyger, Curt, "NATO in the wider world. A neutral state's perspective", NATO Review (February 1989), pp.29-33.

Gat, Azar, "Clausewitz on Defence and Attack", Journal of Strategic Studies (March 1988), pp.20-26.

Gates, David, "Area defence concepts: The Western German debate", Survival (July/August 1987), pp.301-317.

Gibbins, Eric, "A look into the future for military transport", Defence (February/March 1985), pp.105-107.

-----, "The Controversial Contract Confirmed", Defence (May 1987), pp.289-290.

Gliksman, Alex, "NATO After INF: Toward a New Alliance Consensus", National Defense (December 1987), pp.51-55.

Gnesotto, Nicole, "Union De L'Europe Occidentale: La France, L'Europe, L'Alliance", Defense Nationale (June 1985), pp.41-52.

Godwin, Richard, "Armaments Cooperation - Recognizing The Real Imperative", NATO's Sixteen Nations (October 1987), pp.58-67.

Golushko, I.M., "Logistics Support in Battle", Sovetskoye voyennoye obozreniye (No.5,1984), pp.18-20.

Gontier, Willy, "Belgium", NATO's Fifteen Nations (Special 2/1981), pp.46-47.

Gooch, Adela, "NATO's ministers urged to endorse 'burden-sharing'", The Daily Telegraph (30 November 1988), p.13.

-----, "NATO sticks to 3% target for rise in defence spending", The Daily Telegraph (9 June 1989), p.17.

Goodspeed, M.J., "Spetsnaz: Soviet diversionary forces: checkmate in two moves?", Canadian Defence Quarterly (Summer 1988), pp.43-47.

Goodwin, Jacob, "Smith: Is anybody listening?", Military Logistics Forum (September 1985), pp.44-49.

Gourley, Scott R., "The Soviet Army - Armor and Electronics", Defense Electronics (February 1989), pp.74-78, 85-86.

Gow, Michael, "The defence of the North German Plain", NATO's Fifteen Nations (Special 2/1981), pp.34-37.

Graham, Jr., E.M., "The Dynamism of Army Combat Logistics", Military Review (April 1976), pp.65-75.

Grant, G.A.B., "Airmobility: A trial of strength", British Army Review (December 1986), pp.58-62.

Grant, Richard L., "NATO MP's urge improvement in conventional force capabilities", NATO Review (February 1985), pp.21-26.

Gray, Colin S., "Perestroika and the Realities of Soviet Power", National Defense (April 1989), pp.41-43.

Greenwood, David, "Strengthening conventional deterrence", NATO Review (August 1984), pp.8-12.

-----, "Constructing the European Pillar: Issues and Institutions", NATO Review (June 1986), pp.13-17.



-----, "Towards Role Specialization in NATO", NATO's Sixteen Nations (July 1986), pp.44-49.

-----, "Making better use of resources in NATO", Defence Minister and Chief of Staff (No.2/1988), pp.5-8.

-----, "The British Defence Industry: facing the challenges of the 1990s", Defence Minister and Chief of Staff (No.2/1989), pp.5-9.

Gross, Natalie A., "Perestroika and Glasnost in the Soviet Armed Forces", Parameters (September 1989), pp.68-75.

Grossman, Larry, "Army wants single fuel in NATO pipeline", Military Forum (January/February 1989), p.8.

Guest, Tim, "Developments in Logistics Transport", Military Technology (June 1988), pp.71-77.

-----, "'Incoming!' The UK's SP-70 Howitzer Replacement Programme", Military Technology (June 1988), pp.58-61.

Haagerup, Niels J., "The European Security Identity", NATO's Sixteen Nations (September - October 1984), pp.36-40.

Haberman, Clyde, "Allies Must Share Greater Burden of Defense, Pentagon Official Says", International Herald Tribune (12 October 1988), p.6.

Haig, Alexander, "The Future of Deterrence: Return to the Fundamentals", European Affairs (Autumn 1987), pp.37-39.

Hall, Donald, "European Cooperation in Armaments Research and Development", RUSI Journal (Summer 1988), pp.53-58.

-----, "A New Look for Procurement?", transcript of an address given at a Brassey's Seminar for Industry held in London on 8 December 1989, pp.45-73.

Hall, Robert, "Possible future Developments in the Combined Arms Structure of the Soviet Ground Forces", Jane's Soviet Intelligence Review (March 1989), pp.123-125.

Halloran, Richard, "Allies Warned on Troop Aid", International Herald Tribune (8 August 1988), p.3.

Hamilton, Andrew, "Redressing the Conventional



Balance: NATO's Reserve Military Manpower", International Security (Summer 1985), pp.111-136.

Hamm, Manfred R., "Challenges to NATO after the INF Treaty", Contemporary Review (April 1989), pp.184-189.

Hannig, Norbert, "NATO's Defense - conventional options beyond FOFA", International Defense Review (July 1986), pp.897-898

Harned, Glenn M., "Offensive Rear Battle", Military Review (February 1986), pp.30-35.

Harris, Bruce R., "Army Theater Area Communications: 1990 and Beyond", Signal (May 1989), pp.37-41.

Hartley, Keith, "Men, Money and Material", transcript of an address given at a Brassey's Seminar for Industry held in London on 8 December 1989, pp.47-58.

-----, & Hooper, Nick, "Defence Procurement and the Defence Industrial Base", Public Money (September 1987), pp.21-26.

Haslam, Jonathan, "Soviets take fresh look at Western Europe", Bulletin of the Atomic Scientists (May 1988), pp.38-42.

Hawish, Mark, "UK Logistics Update", International Defense Review (July 1986), pp.946-947.

Heisborg, Francois, "A European Defence Industry: dream or reality?", NATO's Sixteen Nations (December 1988 - January 1989), pp.24-27.

-----, "The three ages of NATO strategy", NATO Review (February 1989), pp.24-29.

Hemsley, John, "The Influence of Technology upon Soviet Operational Doctrine", RUSI Journal (June 1986), pp.21-28.

Herzfeld, Charles, "Technology National Security: Restoring the US Edge", The Washington Quarterly (Summer 1989), pp.171-183.

Hines, John G., & Petersen, Phillip A., "Strategies of Soviet Warfare", Wall Street Journal (7 January 1983), p.5.

-----, "The Warsaw Pact Strategic Offensive: The OMG in context", International Defense Review (October 1983), pp.1391-1395.

-----, "Changing the Soviet System of Control", International Defense Review (March 1986), pp.281-289.

-----, "Is NATO thinking too small? A comparison of command structures", International Defence Review (May 1986), pp.563-572.

-----, "Thinking Soviet in Defending Europe", Defence (October 1986), pp.511-520.

-----, & Trulock III, Notra, "Soviet Military Theory from 1945-2000: Implications for NATO", The Washington Quarterly (Fall 1986), pp.117-137.

Hintermann, Eric, "European Defence: A role for the Western European Union", European Affairs (Autumn 1988), pp.31-38.

Hinton, Isabel, "NATO seeks a greater political role in Europe's transformation", The Independent (4 December 1989), p.8.

Hodgkinson, David, "US Deterrence Policy in the Late 1980s: MAD Disavowed?", Defence Force Journal (May/June 1989), pp.58-63.

Holcomb, James F., "Soviet Forward Detachments: A commander's guide", International Defense Review (May 1989), pp.551-555.

-----, & Turbiville, Graham H., "Soviet desant Forces Part 1: Soviet airborne and air-assault capabilities", International Defense Review (September 1988), pp.1077-1082.

-----, "Soviet desant forces Part 2: broadening the desant concept", International Defense Review (October 1988), pp.1259-1264.

Holder, L.D., & Arnold, Edwin, J., "Moving the Heavy Division", Military Review (July 1988), pp.35-49.

Holmes, Kim R., "Measuring the Conventional Balance in Europe", International Security (Spring 1988), pp.166-173.

Howard, Michael, "The Future of Deterrence", RUSI Journal (June 1986), pp.3-10.

-----, "The Gorbachev challenge and the

defence of the West", Survival (November 1988), pp.483-492.

-----, & de Rose, François and Kaiser, Karl, "Battleground Europe", The Times (10 February 1988), p.10.

Howe, Geoffrey, "The Atlantic Alliance and the security of Europe", NATO Review (April 1987), pp.1-9.

-----, "European Security Cooperation", Survival (July/August 1987), pp.376-380.

-----, "An arch with two pillars - the unequal Alliance", The Independent (23 May 1988), p.15.

-----, "The WEU: the way ahead", NATO Review (June 1989), pp.13-15.

Humphreys, Colin, "Telling it as it is", NATO Review (February 1986), pp.19-23.

Hunter, Robert E., "Will the United States remain a European power?", Survival (May - June 1988), pp.210-231.

Huston, James A., "NATO and International Logistics", Military Review (August 1970), pp.83-90.

-----, "Army Logistics: Lessons of Experience", Military Review (September 1989), pp.76-88.

Hüttel, Rolf, "Aims and activities of the EURO/NATO Training Group", NATO's Sixteen Nations (December 1987 - January 1988), pp.35-39.

Hyden, J.S., "The Soviet Strategic Offensive Operation: Its implications for Home Defence", British Army Review (December 1986), pp.33-38.

-----, "Soviet deep operations: a real threat to NATO?", International Defense Review (June 1987), pp.723-724.

International Defense Review, "The East German Army - an integral part of the conventional threat to NATO", International Defense Review (April 1987), pp.401-403.

Ireland, Andy, "This Hawk Says Recall The Troops", International Herald Tribune (8 March 1989), p.6.

Isherwood, Julian, "Report queries US claims on NATO defences", The Daily Telegraph (22 May 1989), p.3.

Ivanovskiy, Y., "Combat Skill", Sovetskoye voyennoye obozreniye (No.2, 1986), pp.10-13.

Jacchia, Enrico, "For Stability Amid Change", International Herald Tribune (18-19 March 1989), p.6.

Jackson, Paul, "Fuelling Speculation", Armed Forces (February 1988), pp.61-63.

Jane's Defence Weekly, "Three compete in British Army truck trials", Jane's Defence Weekly (11 February 1989), pp.228-229.

Johnson, Thomas E., "Reconstitution: A Combat Force Multiplier", Military Review (September 1989), pp.36-47.

Johnson-Smith, Geoffrey, "The Burden-Sharing Debate Regresses", International Herald Tribune (24 March 1989), p.4.

Jolemore, Kenneth A., "Logistics: A Need for Innovation", Military Review (January 1981), pp.51-59.

Jones, David C., "United States", NATO's Fifteen Nations (Special 2/1981), pp.70-75.

Justinian, "EC legal limits on British Sovereignty", Financial Times (3 July 1989), p.40.

Kaiser, Karl; Leber, Georg; Mertes, Alois & Schulze, Franz-Josef, "Nuclear weapons and the preservation of peace", Foreign Affairs (Summer 1982), pp.1157-1170.

-----, "The NATO strategy debate after Reykjavik", NATO Review (December 1986), pp.6-13.

-----, "Conventional arms control: the future agenda", The World Today (February 1988), pp.22-27.

-----, "Non-poliferation and nuclear deterrence", Survival (March/April 1989), pp.123-135.

Karber, Phillip A., "The Military Impact of the Gorbachev Reductions", Armed Forces Journal International (January 1989), pp.54-64.

Karpov, V., "The Creation and Employment of Strategic of Reserves in the War Years", Voyenno-istoricheskiy zhurnal (No.7, 1985), pp.63-67.

Kastenmayer, Walter W., "Reinforcements and Prepositioning", NATO's Fifteen Nations (October - November 1982), pp.38-44.

Kaufmann, William W., "Who Is Conning the Alliance?",

The Bookings Review (Fall 1987), pp.10-17.

Keegan, John, "Kremlin 'may give up arms parity'", The Daily Telegraph (2 March 1987), p.2.

Keel, Jr., Alton G., "Sharing the collective defence burden. US debate must not be ignored", NATO Review (October 1988), pp.4-9.

-----, "Defence Cooperation in NATO's Fifth Decade", NATO's Sixteen Nations (December 1988 - January 1989), pp.16-20.

Keller, Bill, "Moscow Plans for Big Arms Cut: Ryzhkov Discloses 1995 Target Is 33% Reduction", International Herald Tribune (8 June 1989), pp.1 & 9.

Keltner, Kenneth M & Turbiville, Jr., Graham H., "Soviet Reinforcement in Europe", Military Review (April 1987), pp.35-43.

Kemmerich, Manfred, "The MLRS - Phases II and III: new dimensions in conventional defence", NATO's Sixteen Nations (April/may 1988), pp.71-77.

Kemp, Ian, "NATO: disarming itself?", Jane's Defence Weekly (13 May 1989), p.857.

Kempf, Warren L., "British Army Logistics", Army Logistician (July - August 1986), pp.20-26.

Kenny, Brian, "The British Army in NATO: Need for Change?", The Army Quarterly and Defence Journal (July 1986), pp.263-267.

Kennedy, Gavin, "Defence and Industry: Agenda for Debate", RUSI Journal (Summer 1988), pp.59-64.

Kicklighter, Claude M., "The Central Europe Pipeline System", NATO's Fifteen Nations (Special 2/1981), pp.84-88.

Kiely, D.G., "Defense Management", Defense Analysis (June 1988), pp.153-159.

Kir'yan, M., "Soviet Military Science", Sovetskoye voyennoye obozreniye (No.9, 1985), pp.10-12.

Kissinger, Henry, "A Plan to Reshape NATO", Time (5 March 1984), pp.14-18.

-----, & Brzezinski, Zbigniew, "Europe will not be foresaken", The Times (25 March 1988), p.5.



-----, & Vance, Cyrus, "Bipartisan Objectives for American Foreign Policy", Foreign Affairs (Summer 1988), pp.899-921.

Kloske, Dennis E., "NATO Military Requirements vs Narrow National Priorities", Armed Forces Journal International (December 1987), pp.74-76.

Knapp, Jr., George C., "Tactician, this is Logistician", Military Review (February 1986), pp.20-29.

Knight, Michael, "NATO: The Problems of Middle Age", Brassey's Defence Year Book (1988), pp.3-16.

Kokoshin, A.A., & Larionov, V.V., "Confrontation of General-Purposes Forces in the context of ensuring Strategic Stability", Mirovaya ekonomika i mezhdunarodnyye otnosheniya (No.6, 1988), pp.23-31.

Kondrashov, S., "Conventional Forces - impressions and reflections following a tour", Izvestiya (2 April 1988), p.6.

Kroesen, Frederick J., "The Short Cut", NATO's Fifteen Nations (Special 2/1981), pp.40-44.

Kronenberg, Philip S., "Command and Control as a Theory of Interorganizational Design", Defence Analysis (September 1988), pp.229-252.

Kulikov, Viktor "Warsaw Treaty Military Doctrine - A Doctrine of Peace", NATO's Sixteen Nations (April/May 1988), pp.29-33.

Landry, John R., & Sullivan, Bloomer D., "Forward Support Battalion", Military Review (January 1987), pp.24-30.

Larminie, J.C., "Replenishment within British Army battlegroups", International Defense Review (August 1986), pp.945-949.

Lavoie, Louis, "Is the Tank Dead?", Defense & Diplomacy (May 1989), pp.16-23 & 62.

Lawson, Richard L., "Wartime Host Nation Support", NATO's Sixteen Nations (February - March 1984), pp.71-73.

Ledogar, Stephen J., "Security with arms control: prospects and implications", RUSI Journal (Autumn 1989), pp.12-14.

Legge, Michael, "Burden-Sharing: The View from London", The National Interest (Summer 1988), pp.34-42.

Leibstone, Marvin, "US/NATO Defence Cooperation", Military Technology (April 1988), pp.28-32.

-----, "US Defence Exports: An Industry at the Crossroads", Military Technology (July 1989), pp.17-22.

Leonard, Matthew, "Focus on the Belgian Armed Forces", Defence (April 1989), pp.269-278.

Leskov, V., "Great Britain - A Strategic Survey", Zarubezhnoye voyennoye obozreniye (May 1980), pp.21-26.

Levene, Peter, "A New Look for Procurement?", transcript of an address given at a Brassey's Seminar for Industry held in London on 8 December 1988, pp.59-64.

Lewin, Terence, "United Kingdom", NATO's Fifteen Nations (Special 2/1981), pp.66 & 69.

Lewis, Flora, "NATO, Too, Needs 'New Thinking'", International Herald Tribune (16 March 1989), p.8.

Limburg, Daniel, "Conventional Artillery in the Central Region", NATO's Fifteen Nations (Special 2/1981), pp.105-109.

Lippert, Günter, "Die Logistik der sowjetischen Landstreitkräfte", Soldat und Technik (5 May 1981), translated and disseminated in US Intelligence Information Report 2 218 6640 81 dated 20 November 1981.

Lopatin, A., "Taking the Developing Situation into Account", Tyl i Snabzheniye (December 1985), published in English in Air Force Journal of Logistics (Summer 1986), p.6.

Lucas, Hugh, "Arms cooperation a key NATO programme", Jane's Defense Weekly (27 February 1988), p.340.

Lushev, Petr G., "Soviet and Warsaw Pact Goals and Developments", RUSI Journal (Autumn 1989), pp.3-8.

MacDonald, J.D.; Evans, P.A.; Forrest, D.E.; French, J.P., & Smith, A.R.M., "Training: The Changing Perspective in BAOR", Royal Corps of Transport Review (June 1989), pp.21-22.

Mack, Hans-Joachim, "Conventional Defence Improvements", NATO's Sixteen Nations (October 1985), pp.16-28.

MacKintosh, Malcolm, "Changes in the Soviet High Command Under Gorbachev", RUSI Journal (Spring 1988), pp.49-56.

Mans, Rowley, "Europe: stop arguing and collaborate!", The Army Quarterly and Defence Journal (January 1987), pp.14-23.

Marsh III, Curtis N., "Reconstitution", Military Review (January 1987), pp.56-61.

Marshall, Rick, "Logistics: does this tail wag the tiger?", Defense and Foreign Affairs (August/September 1986), pp.29-31, & 39.

Martin, Laurence, "NATO after the INF Treaty", transcript of an address given at a Brassey's Seminar for Industry held in London on 8 December 1988, pp.14-20.

Marquez, Leo, "The Logistic Warrior", Air Force Journal of Logistics (Spring 1986), pp.9-11.

Mattingly, Mack, "Conventional armaments cooperation: Putting the cart before the horse", NATO Review (October 1987), pp.26-30.

-----, "Conventional Armaments Planning - an urgent need for NATO", NATO's Sixteen Nations (October 1987), p.18.

-----, "NATO Defence Procurement - The Way Ahead", NATO's Sixteen Nations (December 1987 - January 1988), pp.16-19.

Mauthner, Robert, "A time for more than jaw-jaw", Financial Times (7 February 1989), p.21.

McCain, John, "Saving our Alliances: the real issue in burden-sharing", Armed Forces Journal International (June 1989), pp.90,94,96 & 98.

McGwire, Michael, "A mutual security regime for Europe?", International Affairs (Summer 1988), pp.361-379.

McInnes, C.J., "BAOR in the 1980s: Changes in Doctrine and Organization", Defense Analysis (April 1988), pp.377-394.

McInnes, Charles W., "Sustainment Doctrine: not keeping pace with airland battle doctrine", Military Review (February 1988), pp.22-29.

Meacham, James, "The sentry at the gate: a survey of NATO's Central Front", The Economist (30 August 1986), pp.1-22.

Mearsheimer, John J., "Numbers, Strategy, and the European Balance", International Security (Spring 1988), pp.174-185.

-----, "Assessing the Conventional Balance", International Security (Spring 1989), pp.54-58.

Mellor, David, "The INF Agreement: Is it a good deal for the West?", NATO Review (December 1987), pp.1-5.

Mendelsohn, Jack, "Gorbachev's Preemptive Concession", Arms Control Today (March 1989), pp.10-15.

Milam, John H., & Palmer, Diego A. Ruiz, "'Conventional Forces in Europe' What's in the Graphs?", Armed Forces Journal International (January 1989), pp.47 & 52.

Mitchell, Pat, "Increasing the combined operational effectiveness of NATO forces: the role of the Military Agency for Standardization", NATO Review (February 1984), pp.16-19.

Mole, R.L., "Military bulk refuelling - the next twenty years", Royal Corps of Transport Review (June 1988), pp.28-32.

Montero, Ruiz, "Armaments Cooperation - a view from Spain", NATO's Sixteen Nations (October 1987), pp.54-57.

Moodie, Michael, "Managing technological change: an Alliance imperative", NATO Review (August 1986), pp.21-27.

-----, "Burden-Sharing in NATO: a new debate with an old label", The Washington Quarterly (Autumn 1989), pp.61-71.

-----, & Fischmann, Brent, "An action plan for NATO", NATO Review (February 1988), pp.19-24.

Mooradin, M., "DISCOM in a 'come as you are' war", Military Review (June 1978), pp.41-53.

Morony, Thomas, "Transatlantic Military Differences", Brassey's Defence Year Book (1988), pp.99-107.

Mueller, John, "The Essential Irrelevance of Nuclear Weapons: Stability in the Postwar World", International Security (Fall 1988), pp.55-79.

Munro, Neil, "The West German Territorial Army", Armed Forces (April 1987), pp.163-171.

-----, "Front-line supply operations", National Defense (May - June 1987), pp.83-87.



Murray, Ian, "West Germans quarrel with BAOR strategy", The Times (30 May 1989), p.8.

Murray, Lin, "Military spending", New Statesman & Society (16 September 1988), p.31.

Nelson, Ronald R., & Schweizer, Peter, "A New Soviet Military? The Next Generation", Orbis (Spring 1989), pp.195-207.

Newell, Clayton R., "Logistical Art", Parameters (March 1989), pp.32-40.

New Statesman & Society, "The end of Europe", New Statesman & Society (19 May 1989), p.13.

Newsweek, "The high cost of NATO. 'Burden-sharing' becomes a hot US political issue", Newsweek (7 March 1988), pp.16-17.

Nitze, Paul H., "NATO: The disarray could be repaired", International Herald Tribune (15 May 1989), p.4.

Noble, Peter, "Distribution - the quiet revolution", Petroleum Review (February 1987), pp.9-14.

Norris, George T., "Bite the Bullet: looking at red CSS", Field Artillery Journal (March - April 1986), pp.24-25.

Nosov, A., "Rear Services Mobility", Krasnaya Zvezda (23 July 1980), p.2; translated by US Air Force Intelligence Service AFRP 200-1 dated November 1980.

Nott, John, "British Defence Policy: Whither Now?", Brassey's Defence Year Book (1988), pp.27-34.

Nunn, Sam, "If Moscow Means Business, NATO Has Work to Do", International Herald Tribune (21 December 1988), p.4.

-----, talks to Peter Jenkins, "The dangers of the status quo", The Independent (16 February 1988), p.17.

-----, "NATO challenges and opportunities: a three-track approach", NATO Review (June 1987), pp.1-8.

Nye, Jr., Joseph S., & Lynn-Jones, Sean M., "International Security Studies", International Security (Spring 1988), pp.5-27.

Odom, William E., "Soviet Military Doctrine", Foreign Affairs (Winter 1988/89), pp.114-134.



O'Dwyer-Russell, Simon, "NORTHAG 'at minimum safe level' warns new commander", Jane's Defense Weekly (26 July 1986), p.101.

-----, "NORTHAG concept 'aims to win'", Jane's Defense Weekly (26 July 1986), p.116.

Otis, Glenn K., & Pearson, Paul F., "We're Being Outgunned In Field of Fire Support", Army (April 1989), pp.28-32, 35-37.

Owen, Henry, & Meyer, Edward C., "Central European Security", Foreign Affairs (Summer 1989), pp.22-40.

Palmer, Diego A. Ruiz, "Countering Soviet encirclement operations: emerging NATO concepts", International Defense Review (November 1988), pp.1413-1418.

Palmer, John, "The Alliance in Crisis?", Political Quarterly (July 1988), pp.311-320.

Pearson, Paul, "Can Army Fire Support in Europe Do the Job?", Armed Forces Journal International (December 1987), pp.62-68.

-----, "INF Treaty Underscores Vital Role: Bring Up Big Guns", Army (April 1988), pp.42-46.

Peilow, B.F., "Should Logistics Replace Administration as a Principle of War?", Naval Review (July 1987), pp.210-217.

Pengelly, Rupert, "Preparing the M109 for the 21st century", International Defense Review (February 1987), pp.173-176.

-----, "Artillery modernisation: A British view", International Defense Review (February 1987), pp.179-182.

-----, "ISAS heralds hands-off howitzers", International Defense Review (April 1987), pp.425-426.

-----, "Liquid Propellant: one way out of NATO's ordnance logjam", International Defense Review (July 1988), pp.829-833.

-----, & Sweetman, Bill, "FMC's CAP gun: cookoo in the artillery nest?", International Defense Review (June 1989), pp.813-815.

Pepper, R.H., & Leonard, P., "A Soviet New Model Army? Future brigade and corps structures", International Defense Review (March 1989), pp.259-263.

Perle, Richard, "Putting The Onus Back into Europe", The Daily Telegraph (26 November 1987), p.5.

-----, "Burden-Sharing: The view from Washington", National Interest (Summer 1988), pp.42-46.

-----, "To Thwart Bonn and Moscow, Ban Short-Range Nuclear Missiles", International Herald Tribune (29 May 1989), p.8

Perry, Charles M., & Praaning, Rio D., "East-West relations in the 1990s: Politics and Technology", NATO Review (February 1988), pp.25-29.

Peters, Tom, & Weiss, Stanley A., "The Pentagon should be learning from business, not teaching it", International Herald Tribune (10 January 1989), p.4.

Petersen, Phillip A., & Clark, John R., "Soviet Air and Anti-air Operations", Air University Review (March - April 1985), pp.36-54.

-----, "The Modernization of the Soviet Armed Forces", NATO's Sixteen Nations (July 1986), pp.32-38.

-----, & Trulock III, Notra, "A 'New' Soviet Military Doctrine: origins and implications", Strategic Review (Summer 1988), pp.9-24.

-----, "Soviet Views on the Changing Strategic Context of Military Planning", The Journal of Soviet Military Studies (December 1988), pp.451-485.

Phillips, R. Hyland, & Sands, Jeffrey I., "Reasonable Sufficiency and Soviet Conventional Defense", International Security (Fall 1988), pp.164-178.

Pick, Otto, "How serious is Gorbachev about arms control?", World Today (April 1987), pp.66-69.

-----, "Perestroika and the Warsaw Pact", NATO Review, (October 1988), pp.28-33.

Pierce, Thomas S., "Automating Ammunition Resupply", Army Logistician (May 1985), pp.28-30.

Pirog, Robert L., "The Defense Market: Myth or Reality?", Defense Analysis (Vol 3, No.4, 1987), pp.337-347.

Polukhin, N.F., & Paytchenko, Yu.D., "Logistic Support for Mobile Groups on Fronts in Vistula-Oder Operation", Voyenno - istoricheskiy zhurnal (January 1987), pp.30-36.

Pond, Elizabeth, "NATO sees need to beef-up forces", Christian Science Monitor (28 May 1987), p.9.

Ponomarev, Manki, "Criteria of Sufficiency: Two Approaches", Krasnaya zvezda (26 February 1988), p.3.

Poos, Jacques F., "Prospects for the WEU", NATO Review (August 1987), pp.16-19.

Posen, Barry R., "Is NATO Decisively Outnumbered?", International Security (Spring 1988), pp.186-202.

Prior, Lord, "New technology and future defence needs: The industrial perspective", RUSI Journal (Autumn), pp.19-22.

Privratsky, Kenneth L., "Comparing US and Soviet maintenance practices", Army Logistician (September - October 1986), pp.7-9.

-----, "Mobility versus Sustainability", Military Review (January 1987), pp.48-55.

-----, "Sustaining the Corps: Is the COSCOM ready for the Airland Battle?", Military Review (February 1988), pp.40-45.

Raach, George T., "The Logistic Estimate - A New Approach", Military Review (July 1985), pp.65-72.

Rasiulis, Andrew P., "Conventional Arms Control: Stabilizing the Balance in Europe", Canadian Defence Quarterly (Winter 1988), pp.39-41.

Record, Jeffrey and Rivkin, Jr., David B., "Defending Post - INF Europe", Foreign Affairs (Spring 1988), pp.735-754.

Reed, Carol, "1992: A Minefield for the European Defence Industry", Defence (June 1989), pp.409-411.

-----, "'Europe 1992' and the future of transatlantic cooperation", Defence (July 1989), pp.507-512.

Reed, John, "Combat Supplies: Part 1 Fuel", Defence (october 1983), pp.641-646.

-----, "Combat Supplies: Part II Ammunition Handling", Defence (July 1984), pp.395-400.

-----, "Out of Area logistics", Defence (October 1984), pp.580-587.

-----, "A Look at Current and Future Logistic Systems", Armada International (July 1985), pp.38-50.

-----, "A Complex Logistic Task with no Easy Solutions: Some aspects of modern battlefield requirements", Armada International (January 1989), pp.44-51.

Rees, W., "The Federal Republic of Germany: A changing security environment", Political Quarterly (July - September 1989), pp.349-356.

Register, Jr., Benjamin F., "Transportation - A Link in the Logistics Continuum", Army Logistician (September - October 1985), pp.19-21.

Richardson, Phillip A., "Logistic Tasks in NATO: A Central Region Perspective", NATO's Sixteen Nations (February - March 1983), pp.60-64.

Richardson III, Robert C., "NATO Challenges and Opportunities", Journal of Social, Political and Economic Studies (Winter 1987), pp.375-383.

-----, "On Western Security, New Strategies and Defense Costs", Journal of Social, Political and Economic Studies (Summer 1988), pp.115-128.

Rider, Graham W., "System Management and Logistics", Air University Review (November - December 1968), Arizona State University, pp.79-85.

Rogers, Bernard W., "Sword and Shield - ACE Attack of Warsaw Pact Follow-on Forces", NATO's Sixteen Nations (February - March 1983), pp.16-26.

-----, "Follow-on Forces Attack (FOFA): Myths and Realities", NATO Review (December 1984), pp.1-9.

-----, "Tactics and Technology", NATO's Sixteen Nations (May 1985), pp.16-18; 21-22.

-----, "NATO's Conventional Defense Improvement Initiative - a new approach to an old Challenge", NATO's Sixteen Nations (July 1986), pp.14-22.

-----, Remarks made to the Hanns-Seidel-Symposium in Munich on 19 November 1986 and reproduced in SHAPE publication ACE Output (January 1987), pp.1-10.

-----, edited transcript of an on-the-



record interview with David Buchan, Financial Times, on 24 February 1987 reproduced in SHAPE publication ACE Output (March 1987), pp.1-20.

-----, text of an address to the Royal Institute for International Relations in Brussels on 2 March 1987 and reproduced in SHAPE Officers' Association Newsletter (No.73, April 1987), pp.5-14.

-----, article for The Bulletin of the Council for Arms Control reproduced in SHAPE Officers' Association Newsletter (No.74, August 1987), pp.13-16.

-----, interviewed by L. James Binder, "Gen. Rogers: Time to Say 'Time Out'", Army (September 1987), pp.20-38.

Roos, John G., & Schemmer, Benjamin F., "Revolution in NATO's Conventional Defense Looms from 'Competitive Strategies' Initiative", Armed Forces Journal International (October 1988), pp.114-121.

Ross, Jimmy D., "Logistics - A Vision of the Future", Army Logistician (July - August 1988), pp.7-11.

Roth, William V., "After the Nunn-Roth Amendment", NATO's Sixteen Nations (July 1985), pp.15-21.

-----, & Frinking, Ton, "NATO in the 1990s", NATO Review (June 1988), pp.25-29.

Rühle, Hans, "NATO Strategy: the need to return to basics", Strategic Review (Fall 1988), pp.28-35.

Rupp, Rainer W., "Economic cooperation and assistance within the Alliance", NATO Review (February 1985), pp.27-32.

Rush, Myron, "The War Danger in Soviet Policy and Propaganda", Comparative Strategy (Volume 8, 1989), pp.1-9.

Russel, Wolfgang, & Omreng, Helge, "NATO's Maintenance and Supply Organization celebrates 25 years of logistic support", NATO Review (August 1983), pp.22-25.

Rybicki, John F., "Land Mine Warfare and Conventional Deterrence", NATO's Sixteen Nations (September - October 1984), pp.75-82.

Sainsbury, Timothy, "The British Army 1988", Army Quarterly and Defence Journal (April 1988), pp.137-146.



Schaffer, Matt, "Military Offsets = European Tyranny", Armed Forces Journal International (December 1987), pp.80-85.

Schlesinger, James, "Preserving the American commitment", NATO Review (February 1989), pp.13-17.

Schnell, Karl Helmut, "The German-American Two-Way-Street: Retrospective - Status - Outlook", NATO's Sixteen Nations, (October 1987), pp.35-42.

Schwartzbrod, Alexandra, "The French Armament Industry... in waiting", Defence (March 1988), pp.162-170.

Scott, Winfield S., "A Strategic Logistics Force", Strategic Review (Fall 1976), pp.68-75.

Seiffert, Siegfried, "Technical Interoperability of the Command, Control and Information System in the Central Region", Military Technology (May 1987), pp.92-95.

Sella, Amnon, "Red Army Doctrine and Training on the eve of the Second World War", Soviet Studies (Vol xxvii, No.2, April 1975), pp.245-264.

Senghaas, Dieter, "Conventional forces in Europe: Dismantle offense, strengthen defense", Bulletin of the Atomic Scientists (December 1987), pp.9-11.

Shaw, Terry, "Logistics on the Way", Field Artillery Journal (March - April 1986), p.23.

Shenfield, Stephen, "In Quest of Sufficient Defence", Detente (No.11, 1988), pp.26-29.

Shilling, David M., "Europe's conventional defence: Solid progress but challenges remain", Survival (March - April 1988), pp.122-133.

Sidebottom, William J., "The Division's Logistician", Army Logistician (September - October 1986), pp.31-33.

Sigal, Leon V., "Conventional forces in Europe: Signs of a Soviet shift", Bulletin of the Atomic Scientists (December 1987), pp.16-20.

Simkin, Richard, "The Universal Net", British Army Review (December 1986), pp.20-24.

Sloan, C.E.E., "ABCA - The Next 20 Years", British Army Review (August 1987), pp.46-49.

Sloan, Stanley R., "Conventional arms control: The

search for a political vision", NATO Review (April 1989), pp.7-11.

Smith, Bradley E., "Maritime Challenges to Sustaining the Force", Military Review (September 1989), pp.20-29.

Smith, Dexter Jerome, "Towards a Stronger Europe", Defence (May 1987), p.234.

-----, "Carrington's Warning", Defence (December 1987), pp.750-751.

-----, "Where Less Can Mean More", Defence (October 1988), pp.739-740.

-----, "The Issue that Just Won't go Away", Defence (November 1988), pp.838-839.

Smith, Homer D., & Simpson, David A., "The NATO Pipeline", Army Logistician (January - February 1985), pp.16-21.

Smith, Jeffrey, "Soviet Army Chief reveals budget cut", The Guardian (28 July 1988), p.8.

Sochaczewski, Joachim, "NATO Command, Control and Information Systems", Military Technology (October 1988), pp.31-33, 35-37.

Sorenson, David S., "Declining Defense Budgets and the Future of the US Defense Industry", Defense Analysis (June 1988), pp.161-173.

Steinberg, James B., "Rethinking the debate on burden-sharing", Survival (January - February 1987), pp.56-78.

Steinhoff, Johannes, "NATO's Strategy and Credibility", NATO's Fifteen Nations (October - November 1982), pp.34-35.

Stephens, Hugh W., "Port Readiness for Military Mobilization", Defense Analysis (March 1988), pp.91-97.

Stevenson, K.A.P., "Praise the Lord and Pass the Ammunition", Royal Artillery Journal (September 1984), pp.95-104.

Stewart, James D., "Evacuating the wounded: why it will be so difficult", Military Logistics Forum (January - February 1986), pp.32-38.

Stewart, James Moray, "Conventional Defence Improvements: Where is the Alliance going?", NATO Review (April 1985), pp.1-8.

Stone, John, "CNAD - Focal Point of Equipment Cooperation", NATO Review (No.1, 1984), pp.10-19.

Stovall, Jess M., "Refuelling on the Move", Army Logistician (January - February 1987), pp.2-5.

Streatfield, T.S.C., "Logistic Management in the Army", Royal Artillery Journal (March 1978), pp.7-13.

Styles, R.L., "MLRS: The Decisive Edge", Journal of the Royal Artillery (September 1988), pp.122-126.

Sullivan, B. Don, "Combat Logistics in Urban Areas", Army Logistician (January - February 1983), pp.6-9.

Sullivan, Bloomer D., "Logistical Support for the Air Land Battle", Military Review (February 1984), pp.4-16.

-----, & Hills, Thomas L., "Logistics Support for the Field Artillery Brigade", Army Logistician (November - December 1985), pp.6-11.

-----, "The Best Answer of All: A Logistics Support Battalion for the Field Artillery Brigade", Field Artillery Journal (March - April 1986), pp.6-10.

Sullivan, Bloomer D., "Future European Battlefield", Military Review (July 1988), pp.50-56.

Sullivan, Jr., Leonard, "Major Defense Options", The Washington Quarterly (Spring 1989), pp.97-114.

Sullivan, Scott, "Sending the Allies a message", Newsweek (23 January 1989), p.13.

Tarantino, Frederick A., "A Substitute for NATO's Nuclear Option?", Military Review (March 1988), pp.24-35.

Taylor, Trevor, "Britain's response to the Strategic Defence Initiative", International Affairs (Spring 1986), pp.217-230.

Thies, Wallace J., "On NATO Strategy: Escalation and the Nuclear Allergy", Parameters (September 1988), pp.18-33.

-----, "Crisis and the Study of Alliance Politics", Armed Forces and Society (Spring 1989), pp.349-369.

Thompson, Andrew, "The NATO consensus", Cambridge Review of International Affairs (Spring 1988), pp.7-15.

Thompson, Graham N., & Kinnear, James, "The Bear's Tail", Armed Forces (August 1988), pp.368-374.

Tillery, George C., Will the INF ban increase chances of war in Europe?", Army (May 1988), pp.22-30.

Tillotson, John, & Lowe, Paul, "Pie in the Sky?", Miltronics (June - July 1989), pp.29-30 & 33.

Tindermans, Leo, "The Political Development of the European Community", NATO's Sixteen Nations (July 1987), pp.14-19.

Traxler, Vieri, "The CSBM negotiations in Vienna: background and prospects", NATO Review (October 1989), pp.5-10.

Trefgarne, Lord, "European Defence Collaboration: IEPG enters a new phase", NATO Review (August 1989), pp.17-20.

Turbé, Gérard, "Military Transport Vehicles: Keeping armies on the move", International Defense Review (Supplement IV/1986), pp.7-8.

-----, "French logistics - the chain principle", International Defense Review (July 1986), p.942.

-----, "Tactical vehicles: market prospects and development trends", International Defense Review (April 1987), pp.450-465.

Turbiville, Graham, "Soviet Logistic Support for Ground Operations", RUSI Journal (September 1975), pp.63-69.

Turbiville, Jr., Graham H., "Soviet Logistics Support Concepts Change", Army Logistician (March - April 1987), pp.2-7.

-----, "Logistics: Sustaining Theater Strategic Operations", Journal of Soviet Military Studies (April 1988), pp.81-107.

-----, "Rear Service Support: Concepts and Structures", Military Review (Winter 1989), pp.71-79.

Twining, David T., "Soviet Strategic Culture - The Missing Dimension", Intelligence and National Security (January 1989), pp.169-187.

Tyler, Patrick E., & Moore, Molly, "Pentagon sees possible 50% troop cuts in Europe", International



Herald Tribune (18 December 1989), p.5.

Urban, Mark, & Pringle, Peter, "Assessing the arms divide", The Independent (7 May 1987), p.4

Urban, Mark, "Exercise will cut NATO battle plan", the Independent (4 September 1987), p.3.

-----, "Cuts give flesh to doctrinal shift", The Independent (8 December 1988), p.1.

-----, "Rumblings of divorce in the Atlantic alliance", the Independent (4 April 1989), p.19.

Usborne, David, "NATO pledge on higher spending", The Independent (28 May 1987).

Van Eckelen, William F., "The Eurogroup and the US-European dialogue", NATO Review (August 1988), pp.7-14.

Van Houwelingen, Jan, "Western Europe: Prospects for cooperation in defence", RUSI Journal (September 1985), pp.10-13.

-----, "Towards European Defence industry", NATO's Sixteen Nations (october 1985), pp.44-49.

-----, "Hanging Together - the MOU process in transatlantic armaments cooperation", NATO's Sixteen Nations (December 1987 - January 1988), pp.25-27.

Vann, John M., "The Forgotten Forces", Military Review (August 1987), pp.2-17.

Vaughan-Arbuckle, I.M., "Logistics in the Falklands", British Army Review (April 1985), pp.45-51.

Von Senger und Etterlin, Ferdinand, "Defence of Central Europe: The Challenge of the 1980s", NATO's Fifteen Nations (Special 2/1981), pp.16-23.

Vredeling, Henk, "Towards a Stronger Europe", NATO's Sixteen Nations (December 1987 - January 1988), pp.20-23.

Vuono, Carl E., "Sustaining Combat Power", Army Logistician (July - August 1988), pp.2-6.

-----, "Providing Modern Conventional Forces to NATO", NATO's Sixteen Nations (October 1988), pp.81-88.



Wade, Ruthven, "Defence Logistics: Evolution or Revolution", Brassey's Defence Yearbook (1978/9), pp.140-152.

Walker, John, "The Air Battle - The First Hours", NATO's Sixteen Nations (September 1988), pp.28-33.

Webster, Pual, "France slashes defence budget", The Guardian (25 May 1989), p.8.

Wegener, Henning, "The Management of change: NATO's Anniversary Summit", NATO Review (June 1989), pp.1-7.

Weinberger, Casper W., "Importance of conventional defence", Jane's Defence Weekly (10 January 1987), p.13.

Wesbrook, Stephen D., "NATO: Bonds that hold it together are stronger than the factors that divide", Army (January 1988), pp.18-31.

Westwood, James T., "The New Soviet Defensive Military Doctrine", Jane's Soviet Intelligence Review (June 1989), pp.278-280.

Wheeler, Albin G., "Operational Logistics in support of the deep attack", Military Review (February 1986), pp.13-19.

White, David, "Squabbling over how to share the burden", Financial Times (25 November 1988), p.12.

-----, "Between cuts and burden-sharing", Financial Times (7 July 1989), p.22.

Whyte, Stuart, "Military Glasnost", International Defense Review (May 1989), pp.559, 561-562, 564-566.

Williams, Peter, "The Future of the SP Gun", NATO's Sixteen Nations (April - may 1988), pp.65-69.

Williams, Phil, "NATO Crisis Management: Dilemmas and trade-offs", The Washington Quarterly (Spring 1989), pp.29-39.

Wilson, D.J., "Canadian Forces Logistics", Army Logistician (May - June 1983), pp.24-29.

Wilson, George C., "US needs new tactics, ex Generals say", International Herald Tribune (4 January 1989), p.3.

Wiltshire, J. Russell, "Supporting the Future Force - Logistics in the 21st Century", Army Logistician (March - April 1985), pp.2-7.

Winkler, William, "Medicine and the modern battlefield", NATO's Sixteen Nations (July 1986), pp.50-53.

Wittmann, Klaus, "NATO's Front Line", Defence (April 1988), pp.256-260.

Wolcott, Barry W., "Combat Medicine", Military Review (January 1987), pp.31-37.

Wörner, Manfred, "The State of the Alliance", RUSI Journal (Autumn 1988), pp1-4.

-----, "NATO in the post-INF era: more opportunities than risks", NATO Review (August 1988), pp.1-6.

-----, "Building a new East-West relationship", NATO Review (February 1989), pp.2-7.

Wray, Ian, "How defence weakens Britain", Management Today (August 1986), pp.38-43 & 76.

Yeremenko, K.K., & Osvyannikov, V.V., "Certain Questions of control of Army Rear Services in offensive operations of the Great Patriotic War", Voyenno-istoricheskii zhurnal (No.10 October 1986), pp.37-41.

Younger, George, "Defence: A Sense of Balance", RUSI Journal (december 1986), pp.3-8.

Zanone, Valerio, "Europe's Role in NATO", NATO Review (April 1988), pp.7-11.

Zavatskiy, Yu I., "The Restoration of the Combat Capabilities of Tank (mechanised) Units and Formations in the course of the offensive according to the experience of the Great Patriotic War", Voyenno-istoricheskii zhurnal (October 1986), p.73.

Zimmerman, Douglas K., "Can a US Army Corps Support itself in war?", Military Review (February 1988), pp.30-39.

Zumbro, Ralph, "Armor's Achilles Heel", Armor (May - June 1989), pp.7-11.

#### SECTION IV

Brassey's Defence Yearbook 1986. London; RUSI/Brassey, 1985.

Brassey's Defence Yearbook 1987 - 88. London; RUSI/Brassey, 1987.

Brassey's Defence Yearbook 1988 - 89. London; RUSI/Brassey, 1988.

British Defence Policy. London; Her Majesty's Stationery Office, 1986.

British Defence Policy 1987. London; Her Majesty's Stationery Office, 1987.

British Defence Policy 1988 - 89. London; Her Majesty's Stationery Office, 1988.

British Military Vehicles 1981. Chertsey, Surrey; Military Vehicles and Engineering Establishment, 1981.

Conventional Forces in Europe: The Facts. Brussels; NATO Press Service, 1988.

Defence Systems International 1989. Consulting Editor Gerald Blakey. London; Sterling Publishers Ltd., 1989.

Europe Our Future. 1992: A European area without frontiers. Luxembourg; Office for Official Publications of the European Communities, 1987.

Europe without frontiers - Completing the internal market. Luxembourg; Office for Official Publications of the European Communities, 1987.

Eurogroup, Western Defense: The European Role in NATO. Brussels; The Eurogroup Secretariat - UK Delegation to NATO, 1984.

Eurogroup, Western Defense: The European Role in NATO. Brussels; The Eurogroup Secretariat - UK Delegation to NATO, 1988.

Force Comparisons 1987: NATO - Warsaw Pact. Bonn; Federal Republic of Germany Information Office, 1987.

North Atlantic Assembly Handbook. Brussels; North Atlantic Assembly International Secretariat, 1987.

NATO and the Warsaw Pact - Force Comparisons. Brussels; NATO Information Service, 1984.

NATO Common Infrastructure. Brussels; NATO Information Service, 1989.

NATO Defence Expenditures of Allied Countries 1970 - 1987. Documented in NATO Review (December 1987), pp.29-30.

NATO Defence Expenditures of Allied Countries 1970 - 1988. Documented in NATO Review (December 1988), pp.30-31.

NATO Facts and Figures. Brussels; NATO Information Service, 1984.

NATO Handbook 1986. Brussels; NATO Information Service, 1986.

NATO Logistics Handbook. Brussels; Senior NATO Logisticians' Conference Secretariat NATO Headquarters; first edition 1986, second edition 1989.

NATO's Northern Army Group. Munchengladbach; HQ NORTHAG Public Information Office, 1984.

NATO 1949 - 1989. Brussels; NATO Information Service, 1989.

Petroleum, Times Business Review 1988, Storage and Transportation in Europe. Maidstone, Kent; Whitehall Press Ltd., 1988.

SHAPE at a Glance. Mons, Belgium; SHAPE Public Information Office, 1989.

Statement on the Defence Estimates 1986. Volume 1, Cm 9763-1; and Volume 2, Cm 9763-2. London; Her Majesty's Stationery Office, 1986.

Statement on the Defence Estimates 1987. Volume 1, Cm 101-1; and Volume 2, Cm 101-2. London; Her Majesty's Stationery Office, 1987.

Statement on the Defence Estimates 1988. Volume 1, Cm 344-1; and Volume 2, Cm 344-2. London; Her Majesty's Stationery Office, 1988.

Statement on the Defence Estimates 1989. Volume 1, Cm 675-1; and Volume 2, Cm 675-2. London; Her Majesty's Stationery Office, 1989.

Strategic Survey 1985 - 1986. London; International Institute for Strategic Studies, 1986.

Strategic Survey 1986 - 1987. London; International Institute for Strategic Studies, 1987.

Strategic Survey 1987 - 1988. London, International Institute for Strategic Studies, 1988.

Soviet Military Power 1986. Washington, D.C.; US Government Printing Office, 1986.

Soviet Military Power 1987. Washington, D.C.; US Government Printing Office, 1987.

Soviet Military Power - An Assessment of the Threat 1988. Washington, D.C.; US Government Printing Office, 1988.

Soviet Military Power - Prospects for Change 1989. Washington D.C.; US Government Printing Office, 1989.

Supply Estimates 1987 - 88, Class 1 Ministry of Defence. London; Her Majesty's Stationery Office, 1987.

The Government's Expenditure Plans 1987 - 88 to 1989 - 90. Volume 1, Cm 56-1. London; Her Majesty's Stationery Office, 1987.

The Military Balance 1985 - 86. London; International Institute for Strategic Studies, 1985.

The Military Balance 1986 - 87. London; International Institute for Strategic Studies, 1986.

The Military Balance 1987 - 88. London; International Institute for Strategic Studies, 1987.

The Military Balance 1988 - 89. London; International Institute for Strategic Studies, 1988.

US Department of State, Atlantic Shield: The 40th Anniversary of NATO. Washington, D.C.; US Information Agency of the Department of State, 1989.



## SECTION V

Abshire, David M., Preventing World War III. New York; Harper & Row, 1988.

Alford, Jonathan, & Hunt, Kenneth, Europe in the Western Alliance. London; MacMillan Press in association with the International Institute for Strategic Studies, 1988.

Anthony, R.N., & Herzlinger, R.E., Management Control in Non Profit Organizations. Homewood, Illinois; Richard D. Irwin, 1975.

Bailey, J.B.A., Field Artillery and Firepower. Oxford; The Military Press, 1989.

Ballantine, Duncan S., US Naval Logistics in the Second World War. Princeton, New Jersey; Princeton University Press, 1947.

Barnett, Correlli, The Collapse of British Power. London; Eyre Methuen Ltd., 1972.

Belenky, Gregory, ed., Contemporary Studies in Combat Psychiatry. Westport, Connecticut; Greenwood Press, 1987.

Bellamy, Chris, The Future of Land Warfare. London; Croom Helm Ltd., 1987.

Berkowitz, Bruce D., American Security. New Haven; Yale University Press, 1986.

Blechman, Barry M., ed., Preventing Nuclear War. Bloomington; Indiana University Press in association with the Center for Strategic & International Studies, Georgetown University, 1985.

Brady, Linda P., & Kaufman, Joyce P., eds., NATO in the 1980s. New York; Praeger Publishers, 1985.

Byely, B., et al., Marxism - Leninism on War and Army. Moscow; Progress Publishers, 1972.

Cahen, Alfred, The Western European Union and NATO. London; Brassey's Defence Publishers, 1989.

Calvocoressi, Peter, World Politics since 1945. London; Longman Group, 1980.

Chandler, A.D., Strategy and Structure. Cambridge, Massachusetts; MIT Press, 1962.

Child, J., Organization: A Guide to Problems and Practice. New York; Harper & Row, 1977.

Cimbala, Stephen J., ed., Challenges to Deterrence. New York; Praeger Press, 1987.

Clausewitz, Carl Von, On War. Edited by Michael Howard and Peter Paret, Princeton, New Jersey; Princeton University Press, 1976.

Coker, Christopher, A Nation in Retreat? London; Brassey's Defence Publishers, 1986.

Cook, Don, Forging the Alliance: NATO 1945 - 1950. London; Secker & Warburg, 1989.

Cordesman, Anthony H., NATO's Central Region Forces. London; Jane's Publishing Company, 1988.

Creasey, Pauline, & May, Simon, The European Armaments Market and Procurement Cooperation. London; MacMillan Press, 1988.

Crowley, Desmond, The Background to Current Affairs. London, MacMillan Press, 1970.

Daniel, Hawthorne, For Want of a Nail: The Influence of Logistics on War. New York, Whittlesey House, 1948.

Dinter, Elmar, & Griffith, Paddy, Not Over By Christmas. NATO's Central Front in World War III. Chichester; Antony Bird Publications, 1983.

Drucker, Peter F., The Practice of Management. London; Pan Books Ltd., 1968.

Eccles, Henry E., Logistics in the National Defense. Harrisburg, Pennsylvania; The Stackpole Company, 1959.

-----, Military Concepts and Philosophy. Rahway, New Jersey; Rutgers University Press, 1965.

Engels, Donald W., Alexander the Great and the Logistics of the Macedonian Army. Berkeley, California; University of California Press, 1978.

Ennis, Harry F., Peacetime Industrial Preparedness for Wartime Ammunition Production. Washington, D.C.; National Defense University Press, 1980.

Finkelstein, Walter, & Guertin, J.A. Richard, Integrated Logistics Support. Bedford, England; IFS Publications, 1988.

Firth, Don, et al., Profitable Logistics Management.

Toronto; McGraw-Hill Ryerson Ltd., 1988.

Flanagan, Stephen, Jr., NATO's Conventional Defences. London; MacMillan Press, 1988.

Frankel, Joseph, International Politics. Conflict and Harmony. London; Pelican Books Ltd., 1973.

Freedman, Lawrence, The Price of Peace: Living with the Nuclear Dilemma. London; Firethorn Press, 1986.

Galbraith, Jr., & Nathanson, D.A., Strategy Implementation: The Role of Structure Process. St. Paul, Minnesota; West Publishing Co., 1978.

Golushko, I.M., & Varlamov, N.V., Principles of Simulating Automating Rear Services Control. Moscow; Voenizdat, 1982.

Halperin, Morton H., Contemporary Military Strategy. London; Faber and Faber, 1972.

Handy, Charles B., Understanding Organizations. Harmondsworth, Middlesex, England; Penguin Books, 1981.

Hanning, Hugh, NATO our Guarantee of Peace. London; Brassey's Defence Publishers, 1986.

Heiser, Jr., Joseph M., Vietnam Studies: Logistic Support. Washington, D.C.; US Government Printing Office, 1974.

Hemsley, John, Soviet Troop Control. Oxford; Brassey's Publishers Ltd., 1982.

Heyns, Terry L., ed., Understanding US Strategy: A Reader. Washington, D.C.; National Defense University Press, 1983.

Hofer, C.W., & Schendel, D., Strategy Formulations: Analytical Concepts. St. Paul, Minnesota; West Publishing Co., 1978.

Holmes, Martin, ed., British Security Policy and the Atlantic Alliance: Prospects for the 1990s. Cambridge, Massachusetts; Pergamon-Brassey's for the Institute for Foreign Policy Analysis, 1987.

Huntington, Samuel P., The Soldier and the State. Cambridge, Massachusetts; The Belknap Press of Harvard University Press, 1957.

----- ed., The Strategic Imperative: New Policies for American Security. Cambridge,

Massachusetts; Ballinger Publishing Company, 1982.

Huston, James A., One For All. Newark; University of Delaware Press, 1984.

Janowitz, Morris, The Professional Soldier. London; Collier MacMillan Publishers, 1971.

Joffe, Josef, The Limited Partnership - Europe, the United States, and the Burdens of Alliance. Cambridge, Massachusetts; Ballinger Publishing Company, 1987.

Jomini, Antoine Henri, Summary of The Art of War. A condensed version edited and with an introduction by Brig. Gen. J.D. Hittle; Harrisburg, Pennsylvania; Stackpole Books, 1947.

Jones, James V., Integrated Logistics Support Handbook. Blue Ridge Summit, Pennsylvania; TAB Books Inc., 1987.

Kaplan, Lawrence S., NATO and the United States - The Enduring Alliance. Boston, Massachusetts; Twayne Publishers, 1988.

Kennedy, Gavin, Burden-Sharing in NATO. London; Duckworth Press, 1979.

-----, Defense Economics. London; Duckworth Press, 1983.

Kennedy, Paul M., The rise and fall of the great powers: economic change and military conflict from 1500 to 2000. London; Unwin Hyman Ltd., 1988.

Kissinger, Henry A., Nuclear Weapons and Foreign Policy. London; Oxford University Press, 1957.

Luthans, Fred, Organizational Behaviour. Tokyo; McGraw-Hill Book Company Japan, 1981.

MacKenzie, J.J.G., & Reid, Brian Holden, The British Army and the operational level of war. London; Tri-Service Press Ltd., 1989.

Moore, Peter G., Reason By Numbers. Bungay, Suffolk; Richard Clay (Chaucer Press) Ltd., 1980.

Mullins, James P., The Defense Matrix. San Diego, California; Avant Books, 1986.

Olvey, Lee D., Leonard, Henry A., & Arlinghaus, Bruce E., eds., Industrial Capacity and Defense Planning. Lexington, Massachusetts; Lexington Books, 1983.

Peters, Thomas J., & Waterman, Jr., Robert H., In Search of Excellence - Lessons from America's best-run companies. New York; Harper and Row Publishers, 1982.

Porter, Michael E., Competitive Strategy. London; Collier-MacMillan Publishers, 1980.

Raj, Christopher, F., American Military in Europe: Controversy over NATO Burden-Sharing. New Delhi; ABC Publishing House, 1983.

Reznichenko, V.G., et al., Tactics. Moscow; Voennoye Izdatel 'stvo 1984.

Roper, John, ed., The Future of British Defence Policy. Aldershot; Gower Publishing Company Ltd., 1985.

Rudney, Robert, & Reyhler, Luc, In Search of European Security. Leuven, Belgium; Leuven University Press, 1986.

-----, eds., European Security Beyond The Year 2000. New York; Praeger Publishers, 1988.

Savkin, V. Ye., The Basic Principles of Operational Art and Tactics. Moscow; Military Publishing House, 1972, translated and published under the auspices of the United States Air Force (US Government Printing Office, 1982).

Shaw, G.C., Supply in Modern War. London; Faber & Faber Ltd., 1938.

Simkin, R.E., Mechanised Infantry. Oxford; Brassey's Publishers, 1980.

-----, Race to the Swift: Thoughts on Twenty First Century Warfare. London; Brassey's Defence Publishers, 1985.

Simon, Jeffrey, NATO - Warsaw Pact Force Mobilization. Washington, D.C.; National Defense University Press, 1988.

Sloan, Stanley R., NATO's future: towards a new transatlantic bargain. London; MacMillan Press, 1986.



-----, ed., NATO in the 1990s. McLean, Virginia; Pergamon-Brassey's International Defense Publishers in cooperation with the North Atlantic Assembly, 1989.

Stock, James R., & Lambert, Douglas M., Strategic Logistics Management. Homewood, Illinois; Irwin Publishers, 1987.

Taylor, Trevor, Defence Technology and International Integration. London; Frances Pinter (Publishers), 1982.

-----, & Hayward, Keith, The UK Defence Industrial Base. London; a RUSI study published by Brassey's, 1989.

Turbiville, Jr., Graham H., ed., The Voroshilov Lectures: Materials from the Soviet General Staff Academy. Washington, D.C., National Defense University Press, 1989.

Urban, Mark L., Soviet Land Forces. London; Ian Allan, 1985.

Van Creveld, Martin, Supplying War: Logistics from Wallenstein to Patton. Cambridge; Cambridge University Press, 1977.

Volkogonov, D., The Psychological War. Moscow; Progress Publishers, 1986.

Williams, Geoffrey Lee., & Williams, Alan Lee, The European Defence Initiative. London; MacMillan Press, 1986.

Windass, Stan, ed., Avoiding nuclear war: common security for the defence of the West. London; Brassey's Defence Publishers, 1985.

-----, The Rite of War. London; Brassey's Defence Publishers, 1986.